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Electrical World

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Inspection or Obstruction?

FRESH emphasis is given by the recent resolution of the Western Association of Electrical Inspectors to the fact that the spirit of the underwriters' service is not in tune with the electrical industry. Present inspection practice is inadequate. Now comes this proposal that no appliances should be used until approved by the fire insurance men. It might be well to raise the question—What is the real function of the underwriters' inspection anyway?

When a man puts up a building and desires insurance, an inspection is made. The purpose is clear. The inspectors examine it. On the basis of the character of the building and the neighborhood, they appraise the degree of apparent hazard and they fix the rate that he must pay for fire insurance. The owner may build of frame or stone; he may use oil lamps; he may use gasoline; he may do what he will. The underwriters make no effort to control him; they simply charge in accordance with the hazard.

THE insurance man's attitude toward electrical inspection, however, is quite different. He does not examine the use of electricity in the home as a basis of appraisal. He inspects and passes the initial wiring, that's all. Lamps may later be increased in size, or heating devices attached to every socket or heavier fuses put in. He never knows it.

Yet, if underwriters' inspection is to mean anything, it should embrace the building and its entire contents. If conditions are unsafe—be the risk in the wiring, a flue or an appliance—insurance may be withheld or the rate increased, and the central station may shut off the current. This is the protective function of fire insurance inspection.

But the use of electricity *is* safe—safer than stoves or candles. The insurance man knows this in his own home.

THEN why do many fire-insurance policies carry a clause prohibiting the use of electricity for light, heat or power (and then consent in the next paragraph)? This scares people. It hurts the electrical business. It is discrimination—for no printed word appears against matches, open fires or other greater hazards. And now comes this suggestion to restrict the sale of appliances by making approval necessary. This would also hurt electrical men and interfere in everybody's home.

Clearly something should be done. We need a more intelligent and sympathetic inspection that will appraise the risk and safeguard the public but not *prohibit* progress. Much more can be accomplished for fire prevention by constructive co-operation with the public and the industry than by obstruction. And to oppose the growing popularity of electricity is feeble folly.

Inspection must be made effective. But it must not hinder electricity's great service to mankind.

Harry Phillips Davis

A designing and manufacturing executive who has contributed largely, individually and through direction, to the development of numerous types of electrical apparatus.

ON THOSE men who are intrusted with the power of decision as to the development and progress of the electrical art there rests a tremendous responsibility. Their judgment determines the course of progress and thus has not only an immediate effect but one of years. These men must have a breadth of conception that embraces the entire industry, a vision that carries them well beyond the mere needs of the moment, and the power to inspire others and direct their enthusiasm into channels productive of benefits to mankind. Such a man is H. P. Davis, vice-president of the Westinghouse Electric & Manufacturing Company, in executive charge of all of the company's production and engineering. Most of his individual attention as a designer has been given to so-called supply apparatus.

To such devices as switches and insulators Mr. Davis has applied the same engineering skill and painstaking care that are bestowed on the larger and more complicated apparatus. He has taken out seventy-seven patents, mostly covering resistance coils, circuit breakers, controllers, fuse blocks, solenoid brakes, trolley clamps and similar devices. It was, in fact, largely due to his efforts that the Westinghouse company changed from being a builder merely of heavy machinery to becoming a manufacturer of complete lines of apparatus. A troubleless transmission line has been his ideal, and he has done much to remedy those defects in minor details that were so conspicuous in the early days of electrical engineering. In addition, he has accomplished excellent creative work with arc lamps and meters. His arc lamp set a standard in the days when this form of illumination was dominant, and his alternating-current meter (in which Frank Conrad was co-inventor) superseded the original Shallenberger type.

Not only is Mr. Davis known as a designing engineer of high rank but he also has achieved prominence as a manufacturing executive. One of the studies to which he has given constant attention is that of obtaining quantity production through standardization without sacrificing quality. He has the reputation of getting results regardless of difficulties. This was admirably illustrated during the war when, being in charge of the company's East Pittsburgh works, he was intrusted with the fulfillment of the government munitions contracts.

Mr. Davis was born in Somersworth, N. H., in 1869. He was graduated from the Worcester Polytechnic Institute, with the degree of B. S. in electrical engineering, in 1890. After a trip to Europe and a few months spent with the Thomson-Houston Electric Company, he entered the detail engineering department of the Westinghouse Electric & Manufacturing Company in 1891. In 1896 he was placed in charge of this department, and in 1908 he was made manager of the engineering department. This position he held until 1911, when he was elected a vice-president of the company.

Editorial Comment

Electrical World, March 4, 1922

Volume 79 Number 9

Engineers Worship Idols Too Often

THE power transmission engineer on the Pacific Coast, as we have often intimated, has the courage of his convictions and an inclination to do things first and inquire into their possibilities afterward. In particular, when it comes to the matter of voltage the sky is his limit, and with each upward step he gains confidence for a succeeding leap. One of the interesting phases of last year's work in power transmission is the steady working upward of line pressures toward the next plateau, so to speak, that around 220,000 volts. In each instance provision is made for static shields on the strings of suspension insulators in order to equalize the strain along the string instead of throwing most of it on a very few disks. Having long known the insulation limitations imposed by non-uniform voltage distribution and the severity of occasional flashovers, it is surprising that engineers have not tried static shields on a considerable scale before. While the grading of insulators may appear in a form considerably different from any now known, it is one of those theoretical advances that must of necessity work, and it has been tried out sufficiently to show that it does work. Static shields are going into service on several of the Pacific Coast lines very soon and during the next decade we may have other examples of grading if any superpower lines are pushed through.

If engineers do not want to be kicked forward again by our friends in the West they will have to stop burning their joss sticks before the gaudy idol bearing the inscription "Our Standard Construction."

Standardization is much to be commended, but it must never stand in the way of progress.

N. E. L. A. Campaign Gains Strength with Broader Vision

THE National Electric Light Association's campaign, in which it is expected that the forces of the entire industry will be marshaled in a concerted movement for the stimulation and development of better business, seems to be definitely taking shape. The idea apparently was sprung without much preliminary thought, and neither the purpose nor the plan has been very clear. Rather, it has been a spontaneous expression on the part of many men that the time at last is right for the re-establishment of central-station commercial departments and the reawakening of the electrical business. It is a good and cheerful sign.

Now all this hope and confidence is being organized into a plan, on the best possible basis, which is to provide help to those who are willing to help themselves. Committees are collecting and compiling experience, information and ideas which may be presented to communities of every character for their inspiration and assistance in local work. Machinery for national executive direction is being set up. And the whole of it is being shaped into the pictured vision of an opportunity that may be measured.

The slogan that was first announced was an unfortunate choice and has been abandoned. "More business—better business" does not sound the true purpose and the spirit of this movement, for it has within it something finer and bigger than a bald desire to increase immediate sales. It is not to be just another short, high-pressure drive for orders. Rather, the need is to carry to the men and women of the electrical industry itself the confident realization that good times are here again and through them relay this welcome message to the people of each town. And this is not to be a trick of salesmanship. It is not sophistry. It will be predicated soundly on the steadily improving economic status of the country and the world. Organized into this well-sponsored movement, it will administer that vital impulse to the mass psychology and give us confident belief at last that it is time to go ahead and buy and build. And all the nation will be prospered by the increased business activity that will result.

Some Startling Figures on Available Water Power

THE mere fact that most of the nearer and more easily developed water powers in this country have already been exploited need not in these days discourage the engineer from looking further afield. Transmission distances of several hundred miles are now sufficiently familiar to raise few doubts as to the availability of powers of which even a decade ago the development would have been held impracticable. Under these conditions a good deal of interest attaches to some of the recent power surveys in Canada, and in particular to the examination of the undeveloped water power in the Province of Manitoba, just across our northern boundary and a most friendly and prosperous neighbor. A survey of this single province shows in the sum of the available sites more than 3,000,000 hp. on a minimum scale of development and above 5,000,000 hp. if a reasonable maximum of development is assumed. Hydro-electric resources of this extent bring almost measureless possibilities of active industry. Indeed, the practical question is not how to develop the energy, but how to utilize it afterward. Of this huge store of "white coal" 250,000 hp. is on the Winnipeg River, comparatively near to Winnipeg itself—and to the border, if our Canadian friends have energy from this source to spare. The great development, however, will have to be on the Nelson River, the great northward-flowing outlet of Lake Winnipeg into Hudson Bay. The utilization of this means long transmission even in the present sense of the term, but, on the other hand, 2,500,000 hp. makes long transmission worth the while, and utilization resolves itself into a question of markets. Most assuredly the Dominion is safe from a shortage of power whether the oil supply turns out ill or well.

Public Education Needed on the Source of Municipal Power

MUNICIPALITIES in most if not all of the states have no powers other than those delegated to them by the respective state legislatures. Ignorance of this fact plays a tremendous part in the public mind in the furtherance of the home rule idea. It is the idea of the average citizen that the powers exercised by the municipality of which he is a part are in some way inherent in the community itself. As a matter of fact, the municipality is organized under laws of procedure passed by the state legislature. For convenience and supposed efficiency in handling municipal affairs certain police and other powers are delegated to the municipal corporations. These powers can be limited or increased at any time the legislature is convinced there is real need for a change. Outside of the powers specifically delegated the municipality may claim nothing. In many cases municipalities have assumed rights that have not been specifically given to them. This has been possible only because no one has questioned these acts. It would not be amiss for the executives of electric light and power companies to inform themselves on the situation in their own states and in turn educate their own public in the matter. To accomplish this might put a different and a more intelligent face on many a home rule controversy.

A Better Contact Between Manufacturers

MOST differences of opinion and purpose between men of kindred interests are the product of misunderstanding. Because they have not habitually worked and talked and thought together on their common problems they have come to look upon these problems as quite individual and their own. And because each travels his own path and follows the association of his own ideas, shaping somewhat divergent aims and methods, each comes to look upon the other as being unconcerned with his affairs, if not competitive and even antagonistic, in matters where really there is the most obvious mutuality of interest.

How and why many such conditions have evolved within the manufacturing branch of the electrical industry is graphically told by Mr. Berresford in this issue. It is a story that should be pondered well by electrical men. We have a most unusual balance of conditions—a few very large manufacturers, a larger group of smaller units and then a lot of little ones. This has produced the same kind of situation within the manufacturing branch that also exists more broadly between the four classes into which the industry as a whole is divided—manufacturers, jobbers, contractor-dealers and central-station men. The result has been a lack of that free interchange of thinking between different kinds of manufacturers, large and small, that is so much needed between the class groups, that the solving of the common problems and the serving of the common ends may have a more harmonious direction and support.

It is hoped and believed that the broader and more centralized organization now embracing the three existing associations of electrical manufacturers may bring greatly increased strength and activity to the progress of both policy and practice. The fact that the heads of our two largest manufacturing systems are now serving personally on an advisory committee in active co-operation with the Electrical Manufacturers' Council promises a new element of co-operation which should mean much in the overcoming of some of the very causes of misunderstanding of which Mr. Berresford speaks.

Conclusions from Questionnaires Must Be Drawn with Caution

OPPORTUNITIES for advance and for new discovery in the field of electric transmission are emphasized by the occasional discussions which arise as to the value of certain types of equipment usually considered to be standard. These discussions also serve as commentaries on the present uncertainty and inadequacy of our knowledge of the natural laws governing the operation of a high-voltage transmission line.

Recent instances of this character were the discussion as to the value of lightning arresters, already commented upon in these columns, and that on the value of the overhead ground wire at the recent midwinter convention of the American Institute of Electrical Engineers. These discussions were occasioned by reports on the returns from questionnaires and other investigation as to the practice and opinions governing in a large number of representative systems.

It was surprising to hear, in connection with the analysis of the investigation as to present practice in the matter of the overhead ground wire, that in some types of transmission line it might be better to omit rather than install an overhead ground wire. There seemed to be no question of the value of the ground wire for a line having steel towers, but omission of the ground wire was stated to be permissible and even conducive to greater reliability in certain types of lines on wooden poles. The ground for this suggestion is apparently the reports from certain operating engineers that the ground wire leads to a lowering of the line insulation to ground and therefore to an increase in the number of insulator failures. This is equivalent to stating that the wood of cross-arms and poles is relied on as a part of the insulation of such a line. It is difficult to understand how a position of this kind can be seriously taken, when such troubles should be avoided, not by eliminating the ground wire, but by the installation of insulators of higher voltage rating.

The value of an overhead ground wire lies principally in the increase of the capacity of the line to ground. This means that any disturbance which may arise at any point is correspondingly reduced in intensity as it advances over the line. A further protection arises in the screening effect of the ground wire against lightning disturbances. While the magnitude of this screening effect has been a matter of discussion, particularly for the case of only one ground wire, it is nevertheless present to some extent. The principles underlying these two types of protection are fundamental and for the most part clearly recognized, as was evidenced by the criticism brought out at the convention of the suggestion that any line might be safer without a properly installed overhead ground wire.

The results of questionnaires and similar investigations of current practice may be of considerable value, particularly when they are directed toward the securing of reports of experience in operation with different classes of equipment. However, it must be recognized that nearly all types of electrical equipment require study in their selection for particular duties as well

as care both in installation and in operation. It may happen that these types of skill and care are not applied to their full extent and in such cases that the equipment in question will not give the most favorable report of itself. Consequently it is not to be expected that all of the results from a widespread questionnaire will be indicative of best contemporary engineering practice and opinion.

Probabilities Must Be Weighed in Substation Design

THE object in the construction of any substation is the provision of the best and most reliable service that can be given the consumer. After the equipment, such as transformers, structure and main oil switches, that is absolutely necessary if service is to be given at all is provided, the designer's next thought is the protection essential to insure good service. It is at this point that the biggest errors are made. It is easy to conjure up any number of happenings that are possible. Because they are possible under some conditions there is a tendency to provide protection against every one of them, and many installations in all parts of the country represent just this sort of engineering. The proper course is to classify the possibilities into various degrees of probability and then estimate the cost of protection against each degree of probability. The designer is then in position to know just what protective measures are justified. He must be guided in every decision by the question of cost weighed against the degree of danger and not by a feeling that all the things theoretically desirable must be forced in somehow or other.

Far-Reaching Influence of the Radio Telephone

THE American Telephone & Telegraph Company has announced that it will establish a radio-telephone broadcasting station in New York City that will be leased in much the same way that its wire service is leased. This is only another step in a remarkable development that has aroused intense public interest in the radio telephone during the past year. The manufacturing companies which have established similar stations, as well as the numerous private stations for broadcasting regular programs, have established a demand for the service that is recognized by the daily press, where full programs for the best-known stations are printed each day. The proposed station in New York will be the first commercial station that can be used by any one who is willing to pay the leasing charge. It is significant that the company announces that it will establish a chain of such stations in other important cities if the demand justifies, and that its long-distance facilities will be used to connect these stations together so that programs given in one section of the country can be heard in another section by any one having a receiving set.

The immediate result of the work of the past few months is shown in the creation of a new army of buyers. Radio-supply stores have sprung up by the hundreds all over the United States, and the manufacturers are finding it impossible to keep up with the demand for equipment. At the moment the retail dealer finds himself short of stock owing to the demand on him. To the disgusted buyer this seems to be a chronic condition, though the difficulty will soon be remedied by the further development of manufacturing facilities. More significant is the character of the customers. A large portion of them are youths ranging from ten to twenty-one. They are not technically trained, and yet even the youngest of them can talk inductance, capacity, impedance, resistance and the other technical terms with a pretty thorough grasp on their meaning and a good appreciation of their application in radio work. The observer is forced to speculate upon the far-reaching effect that this condition will have on the future citizens of the country. Fad though the movement may be styled at the present, the education that these young people are getting is of untold value. It may well prove to be one of the most effective aids in dispelling the mystery that has enveloped the electrical industry in the public mind. At the very least it is taking the minds of the younger generation from amusements that may be questionable and giving them something that will be of tremendous use in the future.

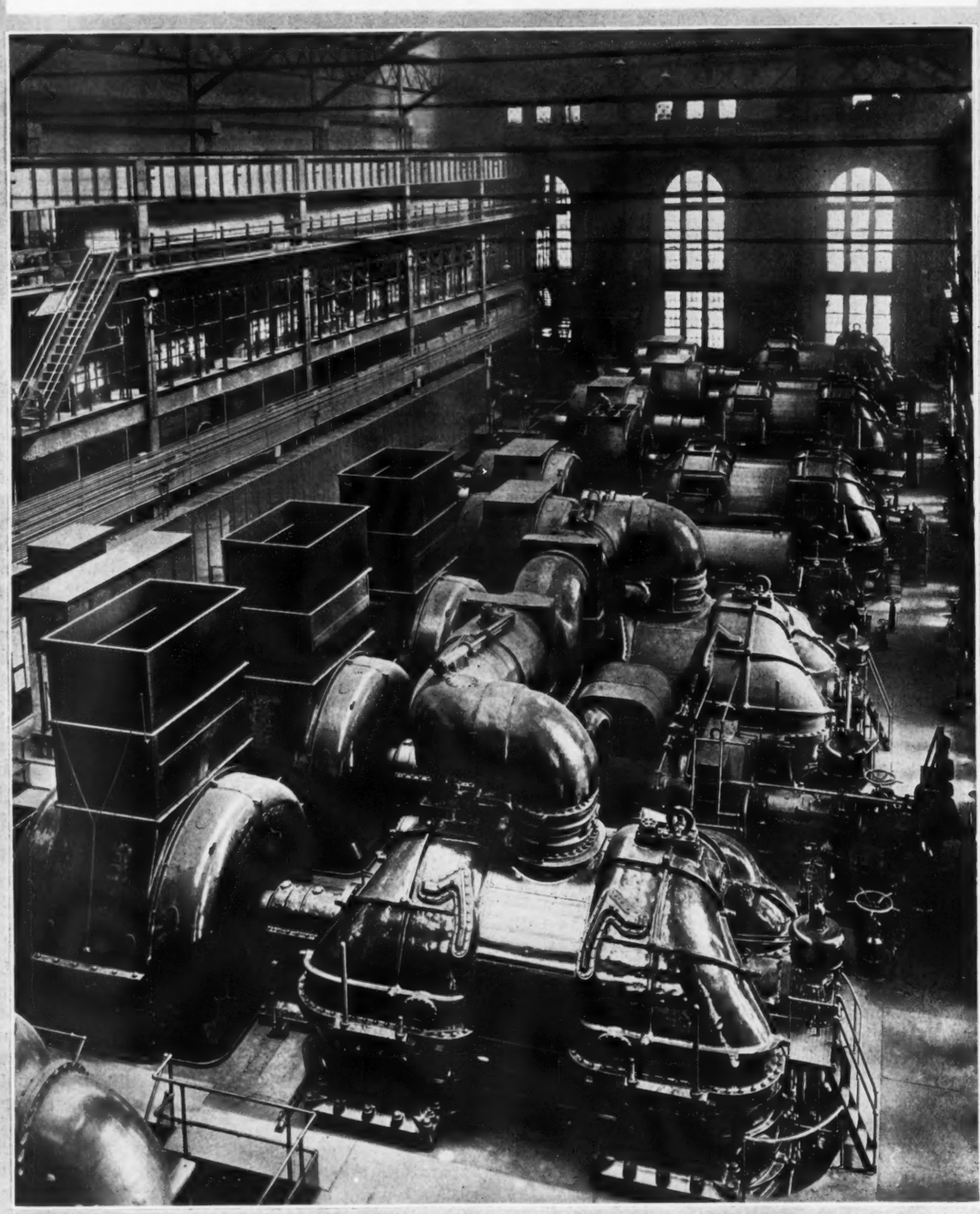
Behavior of Reactors Outdoors Is Encouraging

THE placing of high-voltage terminal and substation equipment out of doors has been generally successful from the start. This has been largely due to the possibility of making the casings of transformers, circuit breakers and lightning arresters completely weatherproof, thus reducing the problem to that of the proper insulation and separation of the connections. A type of equipment which has been somewhat slow in venturing out of doors is the current-limiting reactor. This is probably due to the facts that it is not inclosed and that it relies entirely on the air for insulation between turns. Failures of such reactors have apparently left some doubt as to whether mechanical stresses or abnormal voltages between turns have been the cause. If the latter, obviously the hazard is increased in going out of doors.

To throw light on this question a series of tests have been conducted by the Pennsylvania Water & Power Company. They are reported in this issue by A. F. Bang. Heavy short circuits were thrown on reactors of late type especially designed for out-of-door service, provision being made for severe rain conditions and for the measurement of both current and voltage across the coil. No trouble was encountered, showing that the coils were amply able to withstand the mechanical stresses and that the voltage across the coil was below the normal value for the system and devoid of evidence of high-frequency oscillation. It is concluded that abnormal voltage rises are probably not a danger to installations of this character. However, it is not clear how such a disturbance could be expected under the conditions given, since the electrostatic capacity between the various parts of the coil is undoubtedly extremely small. Obviously the tests do not warrant conclusions as to conditions which may arise in a reactor connected to a long line without intermediate apparatus. All of the conditions for abnormal voltage rises attendant upon an arcing ground or lightning disturbance are present in such a case.

On the other hand, the tests constitute valuable data on the behavior of reactors when used outdoors for limiting current and power under short-circuit conditions. It is also of interest to note that in the case in question, in spite of the increased size and weight of the outdoor type, the saving by the elimination of building space resulted in a net saving of 20 per cent in adopting the out-of-door installation.

Fluctuating Load Carried with Water Rate of Only 11 Lb. per Kw.-Hr. by Three-Cylinder, 60,000-Kw. Turbine



THE three-cylinder cross-compound turbine shown above has carried a fluctuating load with a water rate as low as 11 lb. per kilowatt-hour, according to tests announced last week. It is rated at 60,000 kw. and was installed in the Seventy-fourth Street station of the Interborough Rapid Transit Company, New York, in 1918. With the high-pressure and one low-pressure element in service the lowest water rate was 11.25 lb. per kilowatt-hour. This is better than that for the complete unit when operating at loads below 25,000 kw. The best Rankine and thermal efficiencies obtained were 76 and 25.1 per cent respectively. It is unfortunate that more performance tests are not made public.

European Practices Tend Toward Greater Economy

Standardization of Equipment and Grouping of Related Activities—Waste Heat Boilers, Gas Turbines, Large Mercury Rectifiers and Novel Frequency Changer—Shunt Motors for Shears—Power-Factor Correction

By A. DYCKERHOFF
Electrical Engineer Illinois Steel Company, South Chicago, Ill.

IN EVERY European practice the tendency is toward greater economy because of the great scarcity and high cost of fuel and raw material. To attain this end large power plants are under construction, either near the coal mines—for example, the Golpa plant, rated at 180,000 kva.—or where water power is obtainable, as in the case of the Walchensee project in Bavaria. As many power plants as feasible have been interconnected, the sizes of units have been increased, and attempts are now being made to establish intercompany standardization of electrical machines so that one manufacturer will make a certain line of machines while the other companies standardize on different lines and types. Various industries have established individual heat bureaus that check any waste of fuel, and exchange of experience is facilitated through a central office. In the foregoing activities the various scientific societies have participated, having recently combined into one national organization to co-ordinate their work.

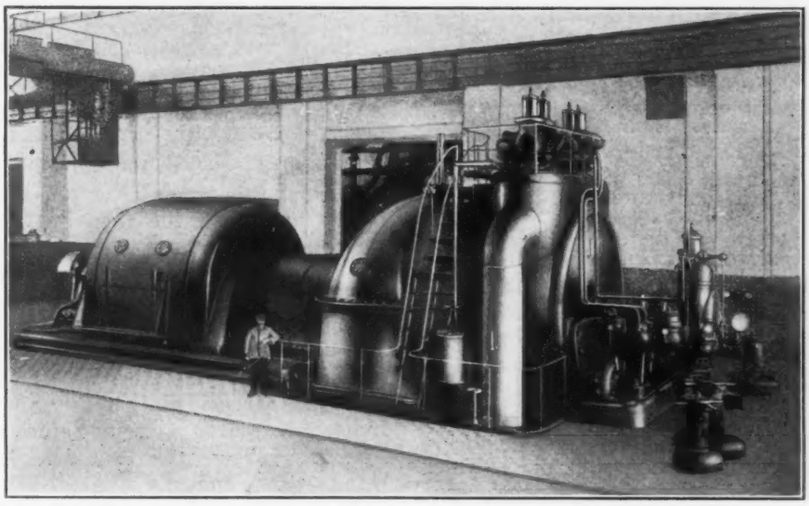


FIG. 1—60,000-KW. SINGLE-SHAFT TURBO-GENERATOR IN GOLDENBURG STATION

A regrouping of the various industries and manufacturers has taken place. Not only have certain steel mills joined hands to enlarge the field of their products with the greatest economy, but companies having different activities have united. For example, one of the largest electrical companies, the Siemens group, has formed a "community of interest" with another group, embracing coal mines, steel mills and machine factories. Another concern, Thyssen, producing steel, coal, mill machinery, gas engines and steam and gas turbines, has taken over an electrical concern. The Allgemeine Electricitäts-Gesellschaft has consolidated with a steel mill in Saxony and a large railroad shop in Silesia. Further, there are certain understandings between concerns making products of different kinds.

This concentration of science and industry has evidently come about through dire necessity and not through governmental fostering.

With the drop in value of the mark the volume of business has so greatly increased that power plants in the industrial districts can, with the prevailing scarcity of coal, scarcely meet the demands upon them. To divide the power available equitably, all large industries are permitted to take power only for a certain period and then only to a specified extent. The result is that the "use factor" of the power plants is very high and a very good thermal economy is being obtained.

Most of the power plants are suffering from a low power factor of about 0.5 to 0.6, owing to the fact that the motors installed during the war were too large for the duty required of them, particularly in mines and steel mills. The detrimental influence is felt more now on account of the linking up of steel mill, mine and public utilities power plants. To ascertain the condition on the lines in the absence of a single suitable meter, two integrating meters are employed, one to measure the active component (wattmeter) and one for the reactive power component. Many power plants are not only limiting or penalizing maximum demands, but are including rate clauses based on the reactive component. For instance, one power plant permits a rebate of 6 per cent to the consumer for reactive-power kilowatt-hours not used and demands from power plants operating in parallel an extra charge of 12 per cent of the kilowatt-hour rate for the reactive power not delivered to the system which joins the plants.

Static condensers have not proved so satisfactory in practice, and synchronous condensers are scarcely ever applied at present on the Continent. The Continent prefers to operate one or two units in the generating station with such an excitation as to offset the reactive power and to equip the main offenders, the large induction motors, with suitable phase advancers. While it is recognized that the crane motors in industrial plants are largely responsible for low power factor, their influence

on the line is small compared with that of large induction motors rated at several thousand horsepower each.

With good boiler-plant practice, efficiencies of 80 to 83 per cent have been attained when using coal, while 87.5 per cent has been reached with boilers using blast-furnace gas and suitable burners.

Steam turbines have been further improved as to size and economy. Frequently a water rate of 5 kg. (11 lb.) per kilowatt-hour, including condensation requirements, is guaranteed for 20,000-kw. units at full load. One kilowatt-hour has been developed from an energy input of 4,360 kg. cal. (17,320 B.t.u.) in some cases, including demand of the auxiliaries. The sizes

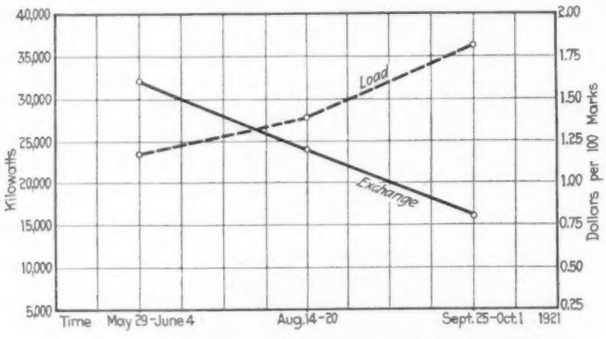


FIG. 2—INFLUENCE OF FOREIGN EXCHANGE ON POWER DEMAND OF A WESTPHALIAN PLANT

of the turbine-driven units have been increased to 60,000 kva. at 1,000 r.p.m. in a plant near the Rhine which is laid out for a capacity of 248,000 kva. However, the experience gained with such very large units is that units of smaller rating are preferable. For this reason 22,000-kva. or an intermediary rating is more popular on the Continent.

PROGRESS MADE IN GAS-ENGINE AND GAS-TURBINE DESIGN

Good progress has been made in the design of the gas engine. The largest unit, as a type, is the 4,000-kw. engine, in the Thyssen Hütte. It is a tandem engine, not a twin tandem, operating at 94 r.p.m., and its dimensions are 1,500 mm. x 1,500 mm. (59.2 in. x 59.2 in.). It is evidently planned to install gas engines of still larger output, since the exhibition in Essen showed a Thyssen gas-engine generator rated at 6,000 kva. and 94 r.p.m. The engine is equipped for scavenging and surcharging to increase the output and the thermal efficiency. It has an efficiency of 27 or 28 per cent at full load, or the equivalent of one net kilowatt-hour per 3,150 kg. cal. (12,500 B.t.u.). Without scavenging and surcharging a good gas engine requires 3,560 kg. cal. (14,100 B.t.u.) per net kilowatt-hour at full load.

Many gas-engine power plants are now equipped with boilers utilizing the exhaust gases to generate steam. Several good waste-heat boilers are on the market. In one instance exhaust gases having an initial temperature of 500 deg. C. (932 deg. Fahr.) leave the boiler at a temperature of 180 deg. C. (356 deg. Fahr.). About 1.2 kg. (2.64 lb.) of steam at 10 atmospheres (142.2 lb. per square inch) is generated per kilowatt-hour from the exhaust gases of the gas engine. To improve the regulation of mixed power plants which have gas-engine-driven and steam-turbine-driven generators, two regulators are sometimes installed, one regulator common to all gas-engine generators and one to the turbine-driven generators. Some Continental gas-engine power plants having turbine-driven generating units to take care of the peak loads and serving considerable roll-motor load have a yearly net average thermal efficiency of about 20 per cent at a load factor of 0.75, constituting an improvement by about 2 per cent in the last eight or nine years.

The research work on the gas and oil turbine which was commenced before the war has been taken up energetically during the last few years. A 1,000-hp. gas turbine has been built and tested thoroughly, and designs are completed for a 10,000-hp. unit to run at 1,500 r.p.m. A model of this was exhibited at Essen. Likewise, a 500-h.p. oil turbine has been completed rated at 3,000 r.p.m. It is said that a thermal efficiency of 25 per cent has been obtained at the circumference of the wheel. This would be equivalent to about 20.5 per cent referred to the generator, so that one kilowatt-hour would require 4,200 kg. cal. (16,700 B.t.u.). Thus at present the gas turbine takes a place between the steam turbine and the gas engine. Evidently many difficulties have been overcome, but still more perseverance and work is needed to make the engine fully reliable.

PROTECTIVE SYSTEM FOR ANTICIPATING FAULTS IN DISTRIBUTION SYSTEMS

Owing to the shorter distances on the Continent, the highest voltage used in the transmission of power has been limited so far to 100,000 volts. Only a few systems operate at this potential at present. One of the latest is the line from the Golpa power station to Berlin. There has been no hesitation to bring the 100,000-volt line into the city proper, over a distance of about 15 km. on towers 26 m. (85 ft.) high, as illustrated on page 120 of the Jan. 21, 1922, issue of the ELECTRICAL WORLD. The highest voltage applied to three-phase cables so far is 35,000. With the growth of the distribution systems, there has arisen the necessity of devices which will indicate defects in a circuit before serious results occur. For this purpose the Pfannkuch protective system is being used to indicate a defect in a cable early enough so that it can be repaired before an actual breakdown occurs.

MERCURY RECTIFIERS OF 2,000-KW. RATING AND NOVEL FREQUENCY CHANGER

The large mercury rectifier has been perfected to a great degree of reliability, and there is great hope that it will be developed to still larger sizes. At least two concerns have placed on the market a line of large rectifiers—their advantages being claimed to be high power factor, high and uniform efficiency, large overload capacity and negligible attendance. The problem of maintaining a high vacuum in the steel containers has evidently been solved satisfactorily, it being possible to maintain the vacuum by operating the vacuum pump about one-half hour a day. The efficiency of the rectifier is about 98 per cent in the 1,200-volt size and about 90 per cent for the 220-volt units. The large standard-size rectifiers in operation are rated at about 500 kw.; however, it is said that sizes of 1,000 kw. and 2,000 kw. have been built with a maximum direct-current voltage of 1,200.

One frequency changer which deserves special mention serves the purpose of changing three-phase, 50-cycle energy to single-phase, 16⅔-cycle energy for railway service. The stator has a special winding similar

to that of a three-phase winding, and the rotor field winding is energized by direct current. There are two overlapping fields, one having two poles and the other six poles. The stator winding is common to both frequencies. Currents at 50 cycles and 16⅔ cycles flow in the same winding, but there are separate taps for the two frequencies. The copper losses are considerably reduced by the winding common to the currents of the two frequencies.

The output of the rotary converters has been increased to about 4,500 kw. at 450 volts to 550 volts and 250 r.p.m. To avoid synchronizing, two methods are generally used. One is to connect the stator of an induction motor in series with the alternating-current side of the rotary. The stator of this auxiliary motor is short-circuited when the rotary has reached synchronism. The other method is to apply low voltage to the slip rings of the rotary.

Higher speeds have been employed to reduce the cost of flywheel motor-generator sets, used in conjunction with mine hoists and reversing-mill motors. The speed of most American flywheel sets is 375 r.p.m., while the Continental practice is 428 r.p.m. This has been increased to 500 and 600 r.p.m., the peripheral speed of the flywheel reaching 130 m. per second (25,600 ft. per minute) and more. Since the losses occurring chiefly in the secondary of the alternating-current motor are increased by 3 to 4 per cent on the average owing to the drop in speed of the set, some flywheel sets are being built now to regain a great part of these losses. This has been accomplished in much the same way that economical speed control of alternating-current induction motors has been attained.

ELECTRICALLY HEATED BOILERS DEVELOPED, THREE-PHASE COMMUTATOR MOTORS LESS FAVORED

Several firms have developed electrically heated steam boilers which are not only used where hydro-electric power is abundant, but also under general conditions. The points in their favor are: Utilization of surplus power, elimination of coal transportation, possibility of

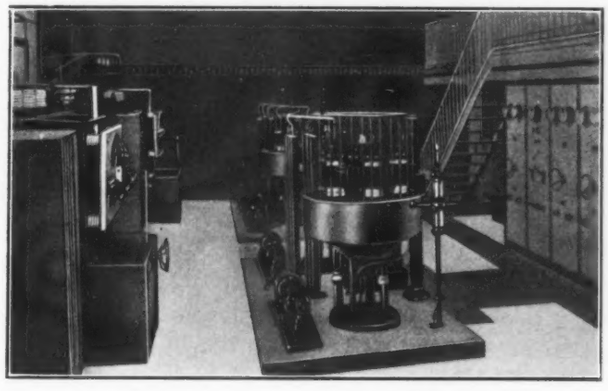


FIG. 3—STATIC RECTIFIER SUBSTATION IS DEVOID OF COMPLEXITIES

locating them where most desirable, and elimination of long pipe lines, saving of attendance and constant readiness for service. The high resistivity of the water which forms the electrolyte permits voltages as high as 10,000 to be used. The electrodes are made of iron and surrounded by cylindrical tubing of insulated material to enable regulation of the length of the circuit between electrodes. The output of the boiler is determined by the number of groups of electrodes. Units up to 6,000 kw. have been developed in which full steam pressure can be attained in less than one hour. Condensate is best suited for evaporation. Owing to the high frequencies employed formation of an explosive gas mixture is practically impossible. Another type of boiler is regulated by changing the water level.

The three-phase commutator motor, as an independent

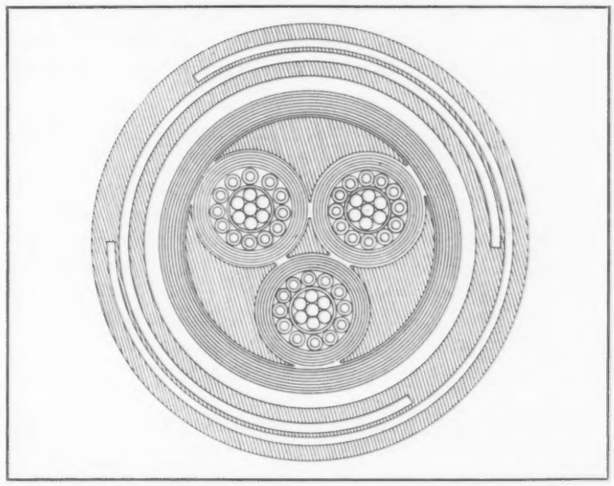


FIG. 4—CROSS-SECTION OF CABLE USED WITH PROTECTIVE SYSTEM SHOWN IN FIG. 5

The core conductor and the layer conductor of each phase are insulated with paper like the individual wires of the outer layer. The odd wires of the outer layer are in parallel, and the even wires likewise, thus forming two wire groups of the outer layer.

unit, has lost its favor lately. Before the war there were great hopes of this apparatus, but these have not been realized owing to the limitations and expensiveness of large applications. The series type has been used on small hoists in mines, etc., in ratings up to 500 hp., the motors being commonly controlled by shifting the brush rigging by means of oil pressure. Commutator motors with shunt characteristics are used in sizes up to several hundred horsepower for pumps, fans and compressors. With these the speed is regulated by impressing different voltages on the rotor from a transformer or from taps of the stator. Alternating-current motors, either small single-phase or three-phase, have been used a great deal for turning lathes and textile machines. As an auxiliary motor in connection with an induction motor, for the purpose of speed regulation, it has been used very moderately in sizes up to a few hundred horsepower.

Very few installations of electrically driven turbo-blowers and reciprocating blowers for blast and bessemer furnaces have been made in the last eight or nine years. The advantage of the motor-driven units is mainly that they can be placed near the furnaces, that they may be easily controlled and require fewer heat units than an individual engine, which is usually operated anywhere between quarter and full load. While the motor-driven one is also subject to the same load, it is connected electrically to the power station which will scarcely be affected by individual load variations due to the diversity of load. Furthermore, generating capacity equivalent to only one-half of the maximum rating of the motor-driven unit has to be installed. In general, there is some tendency to install motor-driven turbo-blowers and electrically driven piston blowers as standby units under favorable conditions.

One of the most severe intermittent services required

of the smaller-sized motors is operation of large shears for cutting steel. The practice is to provide the shear with a flywheel to assist the motor in overcoming the cutting resistance. Since the flywheel and motor are running continuously, the friction load entails high losses. If an alternating-current induction motor is used, the secondary losses for the additional slip must be added. Evidently this does not result in a very economical operation. To improve conditions it is necessary not only to eliminate the flywheel and idle running of the motor, but also to adjust the working speed

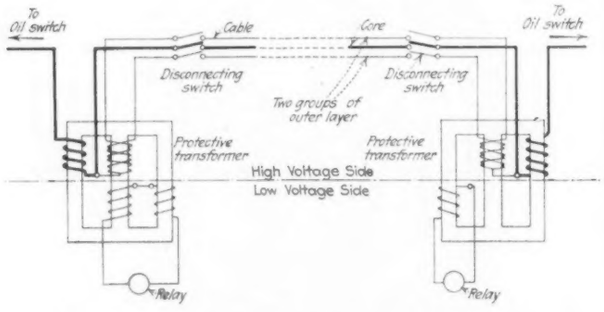


FIG. 5—SIMPLIFIED CONNECTIONS OF PFANNKUCH CABLE PROTECTIVE SYSTEM

The two groups of wires of the outer layer have a small difference of potential impressed by the protective transformer at the beginning of the line, which potential is equalized at the end of the line. Any sufficient change in the insulation due to any cause permits an exchange of the difference of potential. The current thus produced acts on the relays through the protective transformers. The relay is arranged so that, first, it shows the change of the insulation and the phase by a signal (light and indicator) at both ends of the cable and, second, it disconnects the cable for a certain maximum of the leakage current. The system has been tested with a 30,000-volt cable and shown to be so sensitive that small defects were reported by the relays. Sufficient time is given thereby to repair the cable before the breakdown takes place.

automatically to the load, so that overload breakdown of the motor is impossible and so that a predetermined maximum of speed is not exceeded. At the same time the motor must be well utilized at the variable load—*i.e.*, the output must remain constant, which means that torque and speed should be inversely proportional. The direct-current motor of the series characteristic does not fill these requirements, owing to the saturation of the iron and the relation of field and armature current; but the shunt-wound motor is adaptable, if its shunt field is regulated automatically. Some of the newer shears have no flywheel and are driven by a reversible direct-current shunt-wound motor which is started just before each shearing operation. In series with the motor are solenoids which have an armature the position of which determines the amount of resistance in the shunt winding and thereby the speed of the motor most suitable for a certain torque. By this arrangement flywheels are dispensed with, high friction losses are obviated, the motor is used to the maximum of its output and an overload is made virtually impossible.

REVERSING ROLL-MILL MOTORS AND SPEED REGULATION

Large direct-current reversible motors for main-roll trains have increased in size, one being rated at 16,500 hp. with a maximum torque of 240 meter-tons (1,730,000 lb. at 1-ft. radius) and another which is rated at 18,200 hp.

No new developments have been made in speed-regulation devices of induction motors, but the three-phase commutator motor mounted as auxiliary motor on the main motor shaft and the frequency-changer system as well as the Kramer and Scherbius methods have been tried out thoroughly. The Kramer and Scherbius systems have been applied mostly to large fan and rolling-mill drives. The writer has not heard of any installation where any of these systems are used above synchronism. The attitude is that the complication is too great and reliability insufficient if such sets are operated above synchronism.

POWER-FACTOR CORRECTION BY VIBRATOR AND MAGNETIZER

As mentioned before, particular attention has been directed to power-factor correction of large induction motors because it is believed that they are mainly responsible for the low power factor in many power stations. Two methods have been used, the vibrator and the magnetizer with self-excitation. The vibrator consists of three direct-current armatures oscillating in direct-current fields. In each of the three armatures the current of one phase flows. The power factor of the induction motor becomes a trifle leading over a great range of the load and is about unity at 30 per cent load.

The application of the vibrator-type unit is limited by the output of the induction motor and by the fact that it is not suitable for induction motors which operate with a slip increased by the insertion of resistance in the secondary motor circuit. The other machine, the magnetizer with self-excitation, consists of an armature with commutator and direct-current winding in a rotary field which is energized by the rotor current of the induction motor. The armature is rotated by a small auxiliary motor. While the machine is energized by the main rotor current, it is capable, with proper dimensions, of securing phase advancement independent of the load of the induction motor and also at light load. This magnetizer can also be used with induction motors which operate with a slip regulator in the motor circuit, in conjunction with flywheels, as, for instance, for roll trains. The mechanism of the slip regulator is so set that it will act only when a certain average load is exceeded. The magnetizer is so arranged that it will overcompensate the induction motor from friction load to this average load, above which the power factor will shift from leading to slightly lagging, depending on the slip of the induction motor.

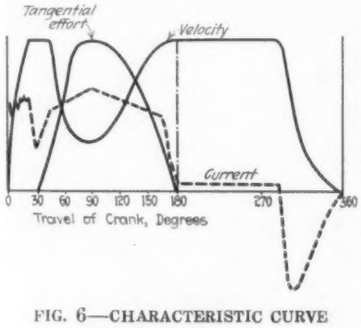


FIG. 6—CHARACTERISTIC CURVE OF MOTOR-DRIVEN SHEAR WITHOUT FLYWHEEL

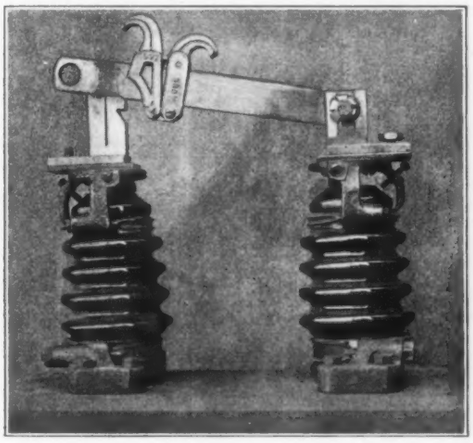
Another application of electric power is the use of the electric arc to remove "piping" from very large steel ingots. The electrodes are supported by a frame placed on the ingot while it is in the ingot mold. The distance of the electrodes from the steel ingot can be regulated. For a 60-ton ingot a transformer of 300-kva. rating is used and the electrodes are about 4.75 in. (12 cm.) in diameter. The electric arc between the electrodes and the steel ingot is sustained for a period of several hours, thereby permitting the cooling of the steel to be regulated and reducing the amount of piping ordinarily formed.

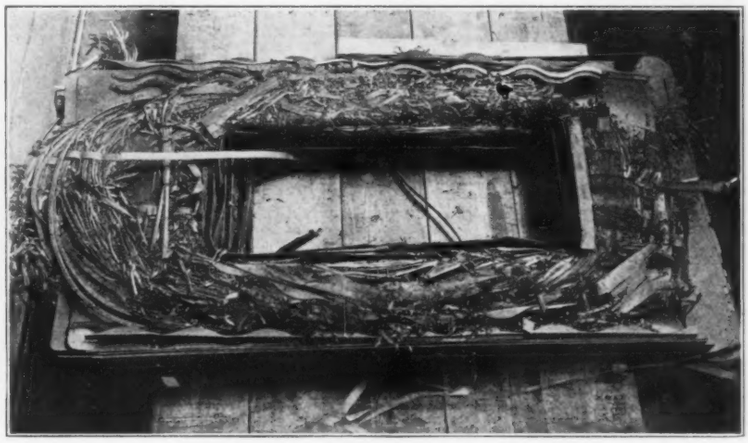
Result of Short-Circuit Tests on Outdoor Type Reactance Coils

Tests Conducted Under Artificial Rainfall Did Not Cause Any Flashovers or Deformation Even Under Severe Short-Circuit Conditions — Saving Effected in Building Structure by Using Outdoor Type

By A. F. BANG
Testing Engineer Pennsylvania Water & Power Company

WITH the ever-increasing growth of electrical power plants and the interconnection of systems formerly separate accidental short circuits have become a matter of very serious concern to all large systems. Experience from the operation of such systems has proved that if too large a short-circuit current is permitted to flow into an accidental fault, it is liable to twist the windings of generators and transformers out of shape, snap off insulators, blow open disconnectors, destroy current transformers, cause the explosion of oil switches which try to clear the short, and work other mischief of a similar sort. In some cases even generator shafts have been broken or the bolts holding the stator to the bedplate sheared off.





FIGS. 1 AND 2—SOME RESULTS OF EXCESSIVE SHORT CIRCUITS THAT MIGHT BE PREVENTED BY REACTORS
Left—Disconnecting switch accidentally forced open during a surge. Right—One coil of a transformer that was badly damaged by a short circuit.

To obviate such difficulties and still maintain the great benefit of the economy resulting from a unified system with only one or a few large generating stations, it has become the policy of all large systems during the last twelve years or so to install reactance coils in series with generators, buses, feeders, etc. Their purpose is essentially a double one—first, to relieve the above-mentioned mechanical and thermal stresses by a reduction of the short-circuit current, and, second, to help to maintain a substantial voltage on the part of the system that is not damaged and thus localize the trouble by preventing the synchronous equipment on this part from falling out of step during the period of the short. Reactance coils of this kind, mainly designed for indoor installation, have long been in service. With the growing tendency to install as much electrical equipment as possible out of doors, reactance coils for outdoor use have also been designed. Inasmuch as installations of this kind are not yet very common, perhaps it may be of interest to describe briefly certain short-circuit tests which recently were made on such coils by the Pennsylvania Water & Power Company and the Consolidated Gas, Electric Light & Power Company on their system in Baltimore, Md.

The reactance coils which were tested were designed by the General Electric Company as feeder reactance coils for a 13,200-volt system. Each coil contains about 2½ per cent reactance in a 4,600-kva., three-phase, 13,200-volt circuit; that is, it has a reactance of 0.955 ohms at 25 cycles. It is rated at 200 amp., 191 volts, 38 kva. The construction is the well-known concrete type in which the windings are held rigidly in position by means of concrete columns cast around the turns after they have been wound in a form. The turns are wound in radial layers which are slightly conical, adjacent layers being inclined in opposite directions. The windings consist of one continuous cable and progress from turn to turn from the outside through to the inside turn in the first layer, then from the inside turn to the outside turn in the second layer, and so on. The minimum clearance between turns and layers is ¾ in. (20 mm.) and the concrete has been thoroughly impregnated under vacuum with a waterproof compound which prevents absorption of moisture. Both concrete and winding are coated with lacquer, producing a smooth, hard finish which sheds water readily. The reactors are braced to withstand the magnetic forces between the different phases of the circuit by means of large petticoat-type insulators having a dry flashover of 90,000 volts. They are also supported from the ground by means of similar large insulators. The net weight of

one of the reactance coils, including sixteen concrete supports, is 3,600 lb. (1,680 kg.).

It has been reported from time to time that a few reactance coils of different manufacture have failed in actual service at the time of heavy short circuits, and there has been considerable discussion as to whether sixteen concrete supports where formerly about ten would have been used. The possibility that such a coil might fail owing to flashovers caused by high voltage between turns or layers nevertheless remains. Therefore it would seem natural that the danger of failure in this way is especially to be feared in reactance coils of

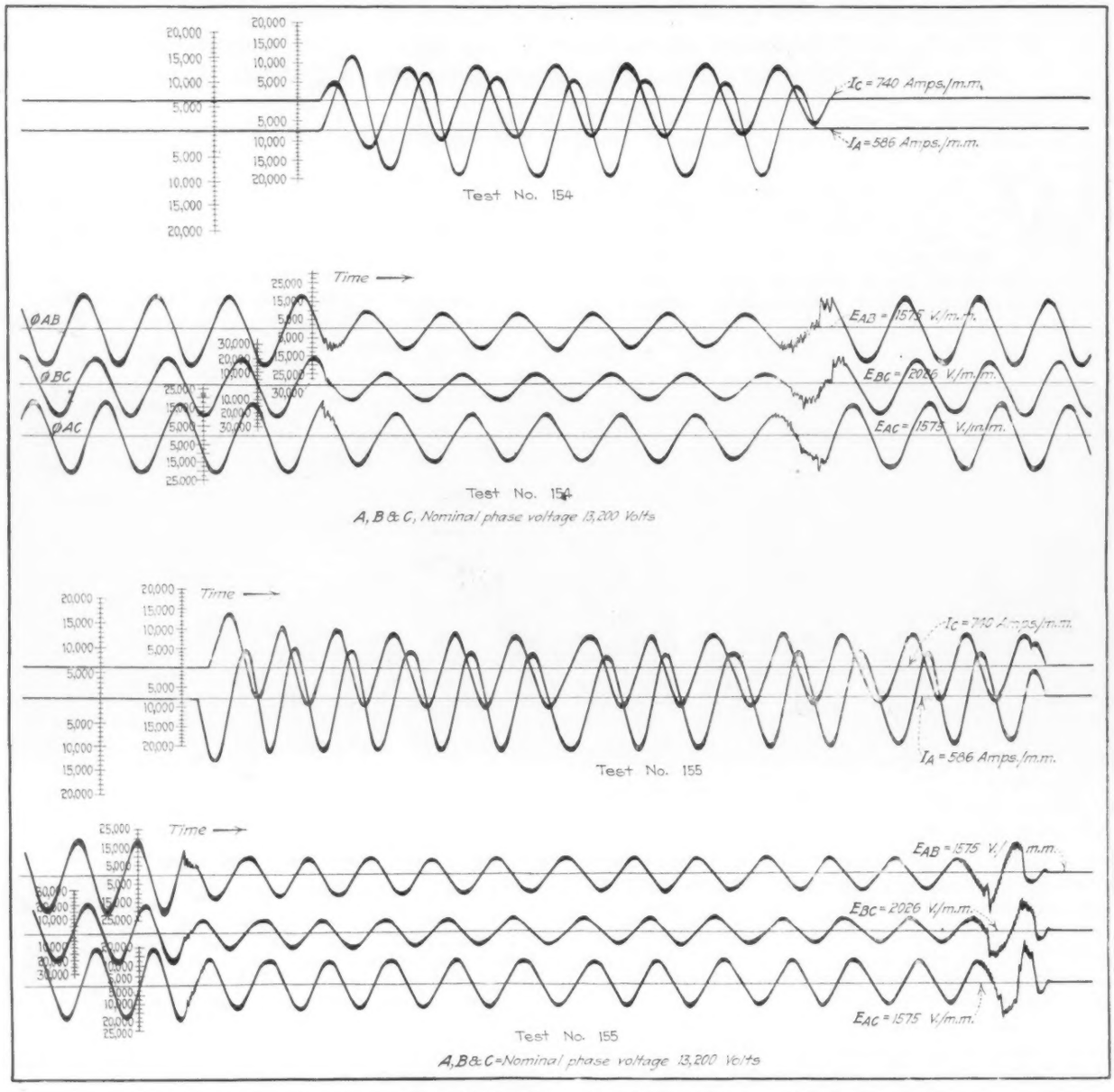


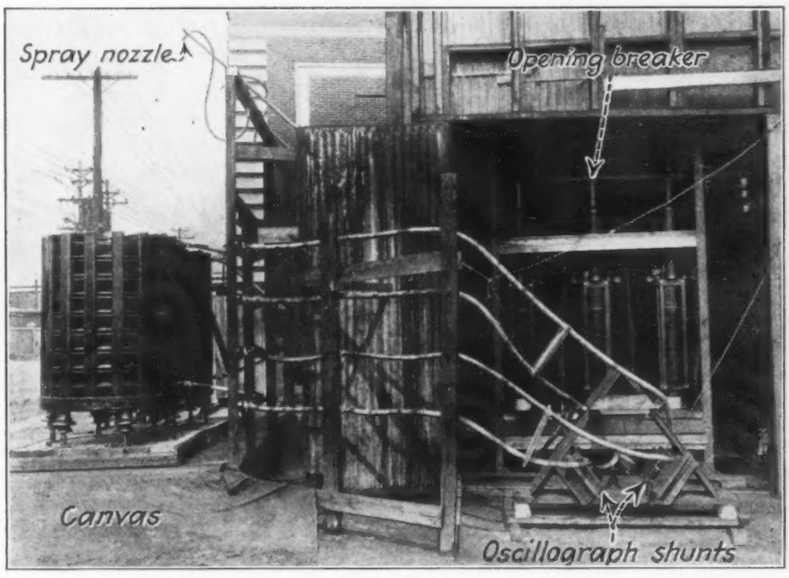
FIG. 3—OSCILLOGRAMS SHOWING CONDITIONS THAT EXISTED DURING SHORT-CIRCUIT TEST

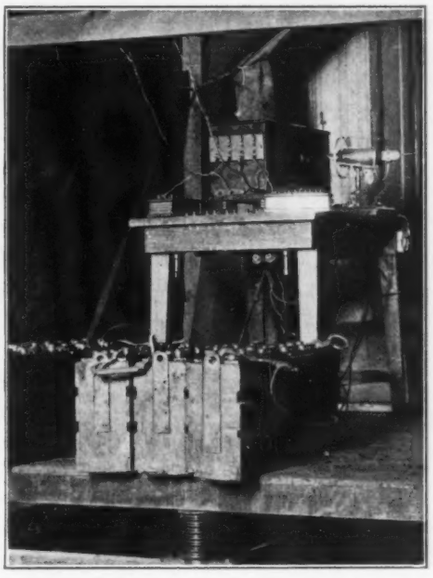
this was due to mechanical stresses set up between turns which caused them to swing together and start a flashover or whether these failures have been due to high surge voltages set up between turns or layers which initiated flashovers and quickly caused a complete failure of the coil. It is now generally held that the chief cause at least of these reported failures has been the extremely heavy mechanical stress set up momentarily at the very peak of the initial short-circuit current when this happens to be greatly displaced. For this reason all modern coils have been much strengthened mechanically by increasing the number of supports for the turns. The present coils, for instance, have the outdoor type if they happen to be subjected to a severe short circuit at a time when they are "soaking wet" from a heavy rainfall. Before adopting this type of coil the Pennsylvania Water & Power Company decided therefore that it would be well to subject such coils to the highest short-circuit current which could be produced on the company's system, while the coils at the same time were exposed to a heavy spray of water.

When installed in the usual way, one in each phase, the highest effective symmetrical current obtainable through these reactors on a 13,200-volt system with unlimited generator capacity behind it would be 13,200 $\div$ ($\sqrt{3} \times 0.955$) = 8,000 amp. (r.m.s. value). Owing

to the reactance in generators and tie lines, etc., however, the present Baltimore system cannot produce more than about 6,300 amp. through one of these coils. In order to obtain approximately this current with the generating capacity of about 120,000 kw. available for the test, only two coils were used for the test and these were connected in open delta across the 13,200-volt phases. It was calculated that this would produce an effective symmetrical current of 7,200 amp. in each of the coils and about 10,600 amp. in the common leg.

The layout of the breakers used for closing and opening the short circuit and also the arrangement of shunts and potential transformers for measuring by oscillographs the current and voltage obtained are shown in the accompanying diagram. As will be seen, the short circuit was a dead metallic three-phase short circuit with the reactance coils next to the short. One oil circuit breaker was used for closing the short circuit, while another opened the circuit immediately after





FIGS. 4 AND 5—ARRANGEMENTS FOR SUBJECTING REACTORS TO SEVERE SHORT CIRCUIT UNDER ARTIFICIAL RAINFALL; BOOTH IN WHICH OSCILLOGRAMS WERE MADE DURING REACTOR TEST

by means of instantaneous relays, thus leaving the short circuit on only for the time necessary for the switch itself to clear, that is, about 6 cycles. The two other breakers were merely intended as protective breakers to clear the short in case of failure of any of the other equipment. The oscillograph which recorded the current waves was mounted on an insulated platform with its own battery for excitation so as to withstand the high potential to which it would be exposed through the drop leads attached to the ungrounded shunts. Current transformers were not used as they were not considered reliable enough to record the transient phenomenon under investigation. Another oscillograph recorded the potential between phases from the low-tension side of standard potential transformers.

The test specification called for a water spray of 1 in. (2.5 cm.) in ten minutes, which is approximately equal to the maximum rate of rainfall recorded in Baltimore. To produce this spray an ordinary lawn-sprinkler nozzle was used mounted about 6 ft. (1.8 m.) above the coils. The rate of spray was measured by continually moving a pan under the spray immediately over the top of the coils and then measuring the depth of water precipitated in the pan at certain intervals. The water used was Baltimore city water, and a sample of this was tested for conductivity and was found to measure about 9,000 ohms per cubic centimeter at 15 deg. C., which is a far greater conductivity than that obtained in ordinary rain water. The water was turned on for from five to ten minutes previous to the short and remained on during the short.

Altogether four tests were made, three with immediate opening of the short and one with a slight delay, leaving the coils subjected to the short a little over half a second. In none of these short circuits did any flashovers whatever take place nor was any deformation of any of the windings noticed. In fact the only evidence that the short was being applied was the slight vibration of the leads connecting the coils with the system. The oscillograms show the current and voltages obtained in the third and fourth tests. It will be noticed that even during the short the voltage across a coil is approximately 7,500 (r.m.s. value). As no more than about 7,620 volts across a coil (r.m.s.-25-cycle value) can be obtained with the normal installation of these coils even from a system with unlimited generator capacity, it is clear that the test proved that these coils, even under heavy rainfall, are sufficiently well insulated to withstand the normal voltage strain between turns and layers obtained during short circuit. As the tests were made virtually under system conditions and as the oscillograms do not show any excess voltage due to surge conditions, it would seem that high-voltage surges between turns and layers do not need to be feared on this installation. The only high frequency in the voltage waves, it will be observed, occurs during the last cycle, when the oil switch clears the short circuit, and is evidently caused by the arc in this switch.

As no very great displacement of the initial current wave took place in any of the tests on which oscillograms were obtained, it is not certain that these coils were exposed to the heaviest mechanical stress which they may be subjected to even on the system where they are being installed. However, it is known from former tests made at the same place on reactance coils of the same type and the same number of supports (except

that they were designed for indoor use) that these have withstood absolutely the highest current to which they could be exposed even on a system with unlimited capacity, and it is therefore considered certain that

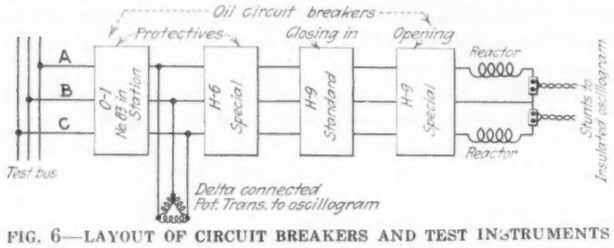


FIG. 6—LAYOUT OF CIRCUIT BREAKERS AND TEST INSTRUMENTS

these coils also would have sufficient mechanical strength.

The outdoor design of reactance coils is necessarily larger and heavier than the indoor type, and the coils of the former type are therefore distinctly more expensive. However, the saving in the building cost is generally so great that it will pay to install the outdoor type of coil. In an installation of three sets of coils on the Pennsylvania Water & Power Company's system it was thus figured that the total cost would be reduced from approximately $46,000 to $37,000. In other words, a saving of approximately 20 per cent would be obtained by using the outdoor type of reactance coils, as it otherwise would have been necessary to build an expensive brick structure around the coils of the ordinary indoor type.

While this is probably the first time that such severe tests have been made on this type of coils, they have actually been in service in several places for a number of years. Thus it is reported that they have given entirely satisfactory service on the Syracuse Lighting Company's system and on the Montreal Light, Heat & Power Company's system for six and four years respectively, notwithstanding the extremely severe winter temperature to which the coils have been exposed. With these facts in mind it may well seem advisable for engineers to consider whether reactance coils of the outdoor design may not be more suitable and less expensive than the indoor type, especially in places which were originally not laid out for the installation of any reactance coils but where later on expansion of the system has made them necessary.

The Electrical Manufacturing Industry*

A Study of Its Organization, the Influence of Its Grouping, the Need and Opportunity for Closer Contact and Association

BY A. W. BERRESFORD
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THE industry founded upon the generation and employment of electricity is probably more complex than any of the other pursuits of mankind and comes into contact to a greater degree than any other with those other pursuits. It is based on pure science and holds little of the empiric. Its content of engineering and research is more important than in any other industry. Its mechanisms call for the maximum of manufacturing knowledge and skill and are complicated by considerations not present in other structures. Their applications call for an intimate knowledge of practically all other arts. In addition, through its supply as a public utility, there comes a governmental contact—municipal, state and federal—present in no other calling. Only through organization and the resultant co-operative effort can the problems incident to so complicated a relation be solved satisfactorily and with adequate dispatch.

On the other hand and considering only that portion of the industry engaged in manufacture, the conditions are the direct reverse of those under which association work ordinarily has its inception and successful growth. It is not natural for the strong to ally themselves with the weak nor for the large to perceive the necessity for association with the small. Ordinarily association takes place between a number of units of similar magnitude, and under such conditions the tendency to promote the relation is at a maximum. Each unit possesses men of substantially the same caliber and of substantially the same acquirement. They speak the same business language and their viewpoint is substantially the same. They understand the conditions which determine a given action on the part of one of their associates, and while criticism may result, distrust due to misunderstanding does not—and distrust is the prime element militating against effective associate effort.

The electrical manufacturing industry is not so constituted. It is made up first of three organizations, two of general and one of special character; next of a comparatively small number of second-line companies, no one of which possesses facilities exceeding one-tenth of any of those listed in the first line, and then of a large number of concerns definitely smaller than the second-line companies and covering in the total a wide line of interests, but each of comparatively narrow horizon. No condition could be more accurately calculated to breed that misunderstanding and distrust fatal to co-operative effort.

It is obvious that association results from need made evident by daily business conditions and must be founded on the confidence that the other man will play fairly and that immediate self-seeking will be subordinated to that enlightened self-interest which indicates the adoption over an extended period of a policy fundamentally right. In the light of the foregoing consider the relation of the large and the small man under the conditions which actually obtain.

With its wide market contact and its statistical accumulation, the large corporation, more accurately than the small, perceives the business trend and shapes its policies accordingly. In the absence of such knowledge and with only his limited facilities as a guide, a minor manufacturer establishes a conflicting policy. The inevitable collision follows, and its inevitable result is

*An address delivered before a recent meeting of the Electrical Manufacturers' Council.

interpreted as a selfish and unfair use of an unwarranted power. Hence a distrust is born which, even if it does not involve an immediate undesirable result, produces distorted viewpoints and hinders progress.

On the other hand, the man at the head of the large company hesitates to assume the lead, in the practical certainty that such leadership will be constructed as an effort to influence the trend of affairs for his own ends. He is practically forced into the position of guiding as he may from the background through the instructed action of less conspicuous members of his organization, and this loses to the industry the constructive effort of which he alone is capable and which would be exerted were he in direct contact and certain that he would not be misunderstood.

I do not assert that there have never been grounds for the suspicion of ulterior motives. Until human nature radically changes men will seek individual advantage. I do assert, however, that such grounds are more frequently given by the subordinate than by the superior, and, moreover, that the suspicion is more frequently based on misunderstanding than on fact.

All of us, large and small, are vitally interested in the prevention of such conditions. Irrespective of magnitude, we progress only as our industry progresses, and I am certain that if these distrusts and misunderstandings could be removed our gain would be enormous.

EDUCATION THROUGH CONTACT

If they are to be removed, it can be only by a process of education, and this can come only through the contact made possible by association. There is no way first to remove them and thereafter to associate. We have established the Electrical Manufacturers' Council, and it is now our task to make the best use of it. We must so arrange our affairs that everything relevant in knowledge and experience shall become available and effective in determining what our underlying policies shall be. To accomplish this with certainty and promptitude we must employ the wisdom, far-sightedness and constructive ability of our best minds. These will be found in the important positions in our large institutions. We must create an atmosphere in which the work of these men will be welcomed and in which they will be encouraged to exert their efforts for the common good. That they will do this with wisdom and fairness if such opportunity is given I am convinced.

On the other hand, this contact with the smaller man and his operations and motives will bring to them as a matter of daily realization the fact that he cannot be ignored if satisfactory progress is to be made; that, no matter how dominating, the major corporation cannot be self-sufficing, and that the health of the industry is predicated on the health of each constituent member.

My plea, therefore, is that in this undertaking which has assumed definite form there be a constant effort to maintain an atmosphere of trust and toleration; that the conditions be such that any man, whatever his relation, may confidently assume office or speak his opinion without suspicion of ulterior motive, and that to such end there be present in our relations a frankness hitherto not always present and which will result in specific expression concerning any condition not deemed satisfactory.

There is no doubt of success if we can do this, and success, I believe, in larger measure than any of us realize. Without it we may not altogether fail for a time, but we cannot hope to endure.

Improving Customer Relationship

An Argument for a Company "Consumers' Department" Which Will Take the Side of the Consumer in Every Complaint or Difference of Opinion

BY EMMET N. BRITTON
Assistant to the General Manager San Joaquin Light & Power Corporation

BACK in the days of pinafores and petticoats, when we had consistently misbehaved and had disregarded all promises of punishment, the nurse would always use as a final threat, "The bogie man will get you if you don't look out," and it generally had the desired result. Today the public utilities of this country are being threatened with the "bogie man" of public ownership, but whether this phantom will remain in the gaseous state or turn into live flesh and blood and become a real menace depends largely upon the attitude of the utilities toward their customers.

In order to assure the consumer of courteous treatment it is necessary first of all that the employees, from the mail boy to the president, be filled with a belief in the company. Sometimes a company is a pretty large unit and the personal touch is hard to keep up, but it can be obtained by building up esprit de corps in the departments of the head office and districts.

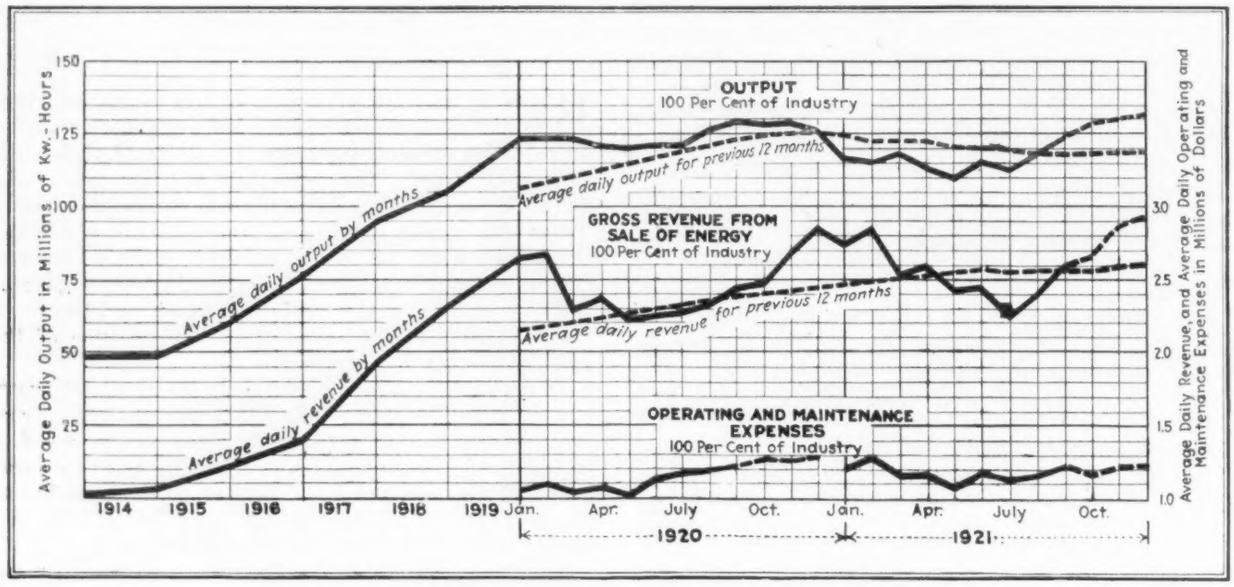
The meter readers, bill collectors, counter clerks and service men are the power company to more than 90 per cent of the consumers, and if they are unshaven and slovenly these consumers with whom they come in contact think of the power company as unkempt and slovenly. These men have a wonderful opportunity to make good will for the company.

The consumer, like all of us, appreciates attention, and a representative of the management should make frequent calls upon the different classes of consumers to find out if they are receiving all of the service to which they are entitled. Complaints received should be followed up with almost religious care, and especially those which are uncovered by questioning the consumer.

A CONSUMER'S DEPARTMENT

The establishment of a department directly responsible to the general manager whose duty will be to represent the consumer will offset the overzealousness of many of the departments whose one idea is to give the company all of the cake and frosting. The head of this department should take the consumer's side of all arguments and fight for him and his interests, forgetting the fact that he is on the payroll of the company. He should make the acquaintance of as many of the consumers as possible and not only help them in increasing the efficiency of their plants but be a real friend at court and their direct representative. He will have access to all of the departments and will be able to give the consumer advice on all matters pertaining to the use of electricity, whether it be engineering or commercial advice. When the consumers come to realize that they have some one working for their interests in the company, he will become their friend and will eliminate little dissatisfactions which might grow to serious proportions. He will be able to show the consumers, individually, the wastefulness of political ownership and so allow the development of our natural resources in the most efficient manner.

December Energy Output Exceeds 4,000,000,000 Kw.-Hr.



CENTRAL-STATION OUTPUT AND GROSS REVENUE MAKE NEW RECORDS

DECEMBER marked an epoch in the history of the electric light and power industry. For the first time the amount of electrical energy sold in any one month exceeded four billion kilowatt-hours and the gross revenue from sale of energy topped the ninety-million-dollar mark. Reports received by the ELECTRICAL WORLD for the month of December from central generating and distributing companies representing 77 per cent of the installed rating of the country indicate that the output of 4,041,000,000 kw.-hr. exceeded that of December, 1920, by 120,600,000 kw.-hr., showing an increase of 3.1 per cent in output for the twelve-month period. The December gross revenue of $90,070,000 indicated an increase of 5.2 per cent over the year previous. In addition, the operating and maintenance expenses during December were 6.1 per cent below those of December, 1920. From an economic viewpoint, therefore, the December returns are most encouraging to the electric light and power industry, especially when the industry is compared with many other primary industries of the country which were still unable to report favorable operations.

The favorable figures must be attributed almost entirely to the large increase in the domestic lighting load during the twelve-month period. An investigation recently completed by the ELECTRICAL WORLD indicated that 1,001,700 new residential customers were added to the lines of the distributing companies during 1921. This new load would be most apparent in December, and the added income received from these new high-revenue customers undoubtedly accounts in large part for the 5 per cent increase in gross revenue. While definite figures are not available, it is probable that the energy sold to industrial customers during December, 1921, was about on a par with that sold to that class of customers during December, 1920.

The energy sold during December was only slightly more than that sold during November. A general slowing down of industry after the spurt in October was reported throughout the country during November and December. Hence, while the lighting load increased materially during December, the industrial load in the

TABLE I—CENTRAL-STATION RETURNS FOR TWELVE MONTHS

	Percentage of Installed Ratings Represented	Kw.-Hr. Output (Companies Reporting) 1921 Thousands	1920 Thousands	Per Cent Increase	Percentage of Installed Ratings Represented	Revenue from the Sale of Energy (Companies Reporting) 1921 Thousands	1920 Thousands	Per Cent Increase
Jan.	77	2,765,632	2,943,349	-6.0	69	$58,855	$50,861	15.8
Feb.	76	2,453,671	2,711,800	-9.4	69	55,540	48,633	14.3
Mar.	76	2,806,609	2,989,581	-6.1	70	55,513	49,071	13.3
April	77	2,675,949	2,895,067	-7.0	72	55,326	49,064	12.8
May	77	2,668,457	2,889,174	-7.6	72	53,901	47,932	12.6
June	77	2,686,479	2,872,900	-6.4	70	52,385	47,977	9.3
July	77	2,706,016	2,949,132	-8.2	70	50,747	49,195	3.4
Aug.	77	2,839,498	3,041,927	-6.7	70	51,931	50,848	2.1
Sept.	77	2,848,212	2,937,339	-3.0	70	54,501	52,955	2.9
Oct.	76	2,997,133	3,045,696	-1.5	71	57,340	55,599	3.1
Nov.	77	3,006,020	2,970,174	1.2	71	61,055	58,381	4.6
Dec.	77	3,112,012	3,018,681	3.1	71	63,951	60,761	4.6

	Percentage of Installed Ratings Represented	Operating and Maintenance Expenses (Companies reporting) 1921 Thousands of Dollars	1920 Thousands of Dollars	Per Cent Increase	OPERATING RATIO Steam Plants 1921	Steam Plants 1920	Hydro Plants 1921	Hydro Plants 1920	Combined Systems of Steam and Hydro 1921	Combined Systems of Steam and Hydro 1920
Jan.	40	14,562	13,085	11.3	56.1	55.3	26.8	27.0	38.1	45.6
Feb.	42	15,085	13,640	10.5	55.6	54.5	22.9	26.0	44.1	47.3
Mar.	52	18,757	17,248	8.7	56.1	57.7	23.4	19.6	40.2	44.8
April	52	17,815	16,641	7.1	53.0	56.5	23.9	19.8	41.4	43.3
May	52	17,274	16,727	3.1	55.4	56.8	24.2	22.9	40.6	44.8
June	53	18,836	19,089	-1.3	56.2	62.5	20.4	21.6	45.0	50.9
July	52	18,633	20,964	-11.1	56.8	65.9	20.6	20.2	43.0	52.6
Aug.	53	19,301	20,900	-7.6	56.2	63.8	22.3	22.2	44.5	52.3
Sept.	53	19,765	21,359	-7.5	54.1	60.3	20.8	22.1	47.3	54.7
Oct.	54	19,828	22,231	-10.8	51.6	60.8	21.3	20.9	45.6	50.8
Nov.	55	19,694	21,780	-9.6	49.9	58.9	23.1	23.3	43.4	50.5
Dec.	55	20,830	22,194	-6.1	47.8	55.9	26.9	29.3	46.1	49.2

aggregate was undoubtedly considerably under that of October and November. The result of these two opposing tendencies in the aggregate was a slight increase in the output over that which was reported for the month of November.

Expressing the financial phase of the returns in terms of the operating ratio, or ratio of operating expenses to gross revenue from sale of energy, gives further evidence of the tendency toward financial prosperity in the electric light and power industry. During December, 1921, the operating ratio of companies having steam electric generating plants only, taken in the aggregate, was 47.8 per cent, as against 55.9 per cent in December, 1920. The average operating ratio for this type of plant during the year 1921 was 54.2 per cent, as against 59.3 per cent during 1920. The average operating ratio for this type of generating plant during the normal year 1912 was 46.8 per cent, which would indicate that the average operating ratio for 1921 was still about 8 per cent above the normal ratio which existed in pre-war times.

Government figures indicate that production during December was less in the majority of industries than in either November or October. To a certain extent this was a seasonal decline. On the other hand, a number of important industries, such as the iron and steel, lumber and paper industries, increased their activities, the result being an increase in industrial energy consumption by utilities serving such industries to a major degree.

For the first time in several months the textile industry of New England reported slight curtailments in operation during December, and the boot and shoe and paper industries also were operating under November. The seasonal increase in the lighting load for this section and the requirements of new lighting customers were undoubtedly counterbalanced by these decreased industrial requirements, resulting in an output about on a par with that of November.

The seasonal dullness in manufacturing due to the holidays and the taking of annual inventories was evidenced in the manufacturing states of the Middle Atlantic and the North Central States. In the Middle Atlantic States, however, industries such as the textile trades, shoe and leather industries and the iron and steel mills showed increased operations during December over those reported for November. The net result in this section was that the central-station industrial load was probably about the same as during the month of November.

In the South Atlantic States some of the large industrial consumers of electrical energy, such as the lumber mills and the coal-mining industry, curtailed their activities materially during December. Textile mills and other primary industries of this section were operating about on a par with November.

The returns indicate, therefore, that during December the industrial energy requirements of the Atlantic section in the aggregate were about the same as during November. The seasonal increase in lighting load plus new lighting customers added during the month was sufficient, however, to result in a total average daily central-station output of about 1,000,000 kw.-hr. in excess of that reported for November. The Atlantic

TABLE II—CENTRAL-STATION RETURNS BY SECTIONS OVER A TWELVE-MONTH PERIOD

	Month	New England States				Atlantic States				North Central States				South Central States				Pacific and Mountain States		
		Percentage of Installed Ratings Represented	1921 Thousands	1920 Thousands	Per Cent Increase	Percentage of Installed Ratings Represented	1921 Thousands	1920 Thousands	Per Cent Increase	Percentage of Installed Ratings Represented	1921 Thousands	1920 Thousands	Per Cent Increase	Percentage of Installed Ratings Represented	1921 Thousands	1920 Thousands	Per Cent Increase	Percentage of Installed Ratings Represented	1921 Thousands	1920 Thousands	Per Cent Increase
KW.-HR. OUTPUT	Jan.	81	200,269	247,800	-19.2	80	1,003,223	1,043,650	-3.9	73	860,643	956,078	-10.0	59	144,936	145,336	-0.3	82	556,561	550,685	1.1
	Feb.	81	178,694	216,890	-17.6	80	902,030	970,539	-7.0	72	789,539	882,873	-10.6	59	131,654	132,537	-0.7	83	451,754	508,961	-11.2
	Mar.	80	205,348	230,309	-10.8	81	1,029,120	1,119,428	-8.1	72	894,500	941,893	-5.0	59	139,381	136,017	2.4	83	538,260	561,934	-4.2
	April.	80	196,680	227,008	-13.3	79	963,659	1,052,716	-8.4	71	828,457	894,028	-7.3	59	132,075	135,421	-2.5	89	555,048	586,894	-5.4
	May.	81	191,141	219,298	-12.8	78	934,973	989,408	-5.5	71	819,506	899,657	-8.9	59	136,573	138,416	-1.3	91	586,264	642,495	-8.7
	June.	80	192,007	219,476	-12.5	78	940,443	1,003,727	-6.3	71	806,270	880,934	-8.5	60	136,011	129,120	5.3	92	611,128	639,637	-4.5
	July.	80	187,622	218,995	-14.3	77	934,822	1,026,390	-8.9	71	804,009	884,572	-9.1	60	140,795	141,450	-0.6	92	639,768	678,725	-5.7
	Aug.	79	205,351	224,324	-8.5	78	992,681	1,054,124	-5.8	71	848,803	923,210	-8.1	60	147,967	154,353	-4.1	93	644,696	685,916	-6.1
	Sept.	79	221,364	223,269	-0.8	78	1,004,252	1,051,268	-4.5	71	851,671	886,370	-3.9	60	149,758	151,680	-1.2	93	621,167	624,752	-0.5
	Oct.	79	249,202	221,929	12.1	78	1,103,525	1,121,676	-1.6	71	919,514	930,236	-1.1	60	154,266	156,713	-1.5	94	570,626	615,142	-7.2
	Nov.	79	247,119	215,565	14.6	77	1,128,063	1,112,346	1.4	71	913,124	907,955	0.5	60	154,125	150,976	2.0	94	563,589	581,857	-3.1
	Dec.	79	255,247	216,756	17.8	78	1,193,251	1,151,355	3.6	71	939,140	920,655	2.0	61	154,407	150,303	2.7	93	569,967	579,612	-1.6
REVENUE			1921	1920			1921	1920			1921	1920			1921	1920			1921	1920	
	Jan.	81	$6,379	$6,170	3.5	73	$22,180	$19,225	15.3	58	$16,818	$14,436	17.3	58	$4,155	$3,484	19.3	82	$9,323	$7,546	23.6
	Feb.	81	5,925	5,728	3.4	73	21,492	18,327	17.4	58	15,971	14,070	13.6	58	3,915	3,329	17.6	83	8,237	7,179	14.7
	Mar.	80	5,784	5,566	3.8	72	21,822	18,934	15.3	58	15,853	14,103	12.4	59	3,747	3,246	15.5	83	8,307	7,222	15.0
	April.	80	5,665	5,554	2.0	72	21,504	18,609	15.8	58	15,506	13,822	12.2	58	3,744	3,312	13.2	89	8,817	7,767	13.6
	May.	81	5,362	5,342	0.4	72	20,795	17,613	18.0	58	14,866	13,558	9.8	59	3,516	3,179	10.7	91	9,362	8,240	13.7
	June.	80	5,285	5,397	-2.4	72	20,058	17,438	15.0	58	14,485	13,519	7.1	59	3,536	3,152	12.2	92	9,021	8,439	6.9
	July.	80	5,180	5,121	1.1	72	18,798	17,155	9.2	58	14,158	14,689	-3.6	60	3,509	3,145	11.3	92	9,101	8,733	4.3
	Aug.	79	5,297	5,483	-3.3	72	19,050	17,926	6.2	58	14,465	14,594	-0.8	60	3,612	3,536	2.2	93	9,507	9,309	2.1
	Sept.	79	5,694	5,857	-2.7	72	19,992	18,750	6.6	58	15,324	15,192	0.8	59	3,811	3,673	3.7	93	9,680	9,482	2.0
	Oct.	79	6,332	6,072	4.2	71	21,520	20,115	6.9	58	16,098	16,175	-0.4	60	3,920	3,903	0.4	94	9,470	9,334	1.4
	Nov.	79	6,806	6,238	9.1	71	23,277	21,540	8.0	58	17,122	16,952	1.0	60	4,139	4,158	-0.4	94	9,747	9,493	2.6
	Dec.	79	7,029	6,563	7.1	72	25,021	22,974	8.9	58	17,705	17,444	1.4	61	4,259	4,189	1.6	93	9,937	9,591	3.6
OPERATING EXPENSES.			1921	1920			1921	1920			1921	1920			1921	1920			1921	1920	
	Jan.	34	$1,098	$1,288	-14.7	49	$6,373	$5,411	17.8	28	$3,941	$3,451	14.2	37	$1,015	$905	12.2	54	$2,135	$2,030	5.2
	Feb.	35	1,069	1,242	-13.9	52	6,799	5,937	14.5	28	3,958	3,445	14.8	41	1,217	1,053	15.5	55	2,042	1,963	3.9
	Mar.	45	1,576	1,651	-4.5	58	7,969	7,241	10.0	34	4,570	4,228	8.2	47	1,776	1,514	17.2	80	2,866	2,614	9.7
	April.	44	1,418	1,479	-4.1	56	7,590	7,168	5.9	34	4,347	4,112	5.7	48	1,567	1,403	11.6	80	2,893	2,479	16.8
	May.	48	1,548	1,577	-1.8	53	6,921	6,660	4.0	36	4,274	4,292	-0.4	49	1,563	1,486	5.2	83	2,969	2,713	9.5
	June.	45	1,737	1,862	-6.7	53	6,916	6,878	0.5	38	4,843	5,152	-5.9	56	1,835	1,678	9.4	86	3,565	3,519	1.3
	July.	46	1,712	2,077	-17.6	50	6,772	7,111	-4.8	37	4,940	5,800	-14.8	58	1,870	2,039	-8.2	86	3,339	3,937	-15.1
	Aug.	47	1,861	2,088	-10.8	50	6,871	7,131	-3.6	37	5,028	5,793	-13.2	58	1,892	2,003	-5.5	92	3,648	3,884	-6.0
	Sept.	47	2,049	2,262	-9.4	51	6,851	7,294	-6.0	38	5,353	5,687	-5.8	59	1,949	2,184	-10.7	92	3,563	4,032	-11.6
	Oct.	47	2,141	2,095	2.1	54	7,175	7,927	-9.5	37	5,011	6,126	-18.2	59	1,990	2,192	-9.2	93	3,511	3,891	-9.7
	Nov.	49	2,040	1,964	3.8	54	7,103	7,790	-8.8	38	4,994	5,980	-16.4	59	1,931	2,262	-14.6	92	3,626	3,784	-4.1
	Dec.	50	2,102	1,892	11.0	54	7,800	8,243	-5.3	37	5,072	6,094	-16.7	59	2,005	2,259	-11.2	92	3,852	3,708	3.8

TABLE III—AGGREGATE OPERATING RATIO OF COMPANIES REPORTING DATA MONTHLY TO THE "ELECTRICAL WORLD"

Type of Generating Plant and Month	New England States				Atlantic States				North Central States				South Central States				Mountain and Pacific States			
			Average for Year				Average for Year				Average for Year				Average for Year				Average for Year	
	1921	1920	1921	1920	1921	1920	1921	1920	1921	1920	1921	1920	1921	1920	1921	1920	1921	1920	1921	1920
Steam Plants:																				
January	54.0	60.8	54.0	60.8	53.5	50.9	53.5	50.9	61.2	61.8	61.2	61.8	53.1	53.7	53.1	53.7	69.0	60.5	69.0	60.5
February	54.3	59.5	54.2	60.3	52.3	53.0	52.7	52.1	63.0	57.9	62.1	59.8	59.1	51.2	56.2	52.3	60.2	60.3	64.3	60.3
March	64.0	70.0	56.7	62.5	54.5	56.7	53.3	53.7	58.4	59.7	60.8	59.8	53.3	50.9	55.0	51.9	68.4	62.5	65.9	61.2
April	59.4	63.5	57.3	62.7	50.9	54.3	52.8	53.8	54.8	61.2	59.3	60.2	54.1	52.8	54.7	52.1	53.7	53.7	61.8	58.6
May	63.2	69.1	58.3	63.8	56.2	58.6	53.4	54.5	54.7	63.3	58.5	60.8	53.3	56.0	54.4	53.0	55.0	57.0	59.9	58.3
June	60.1	71.2	58.7	64.9	55.8	59.5	53.8	55.3	56.6	68.3	58.3	61.8	55.3	60.0	54.6	53.8	53.4	56.2	58.6	57.8
July	60.7	77.3	59.0	66.7	57.2	62.7	54.1	56.1	56.9	70.6	58.1	63.0	55.1	62.4	54.7	55.3	53.3	59.3	57.8	58.0
August	67.3	72.3	60.1	67.3	55.8	61.3	54.2	56.6	56.0	70.0	57.8	63.9	53.3	57.3	54.3	55.7	51.8	59.8	57.0	58.3
September	57.7	71.2	59.8	68.1	52.7	59.4	54.1	56.8	56.9	60.3	57.8	63.6	52.9	60.3	54.2	56.1	46.2	55.7	55.8	57.9
October	57.5	68.5	59.6	67.9	51.3	60.9	53.8	57.3	57.1	63.5	57.0	63.4	51.8	59.2	54.0	56.4	47.8	57.5	54.7	58.0
November	55.5	68.9	59.1	68.0	49.0	59.3	53.3	57.5	56.1	58.8	57.0	63.2	45.8	54.3	53.3	56.2	44.9	52.7	53.8	57.4
December	57.0	62.8	58.8	67.5	46.2	53.1	52.8	57.0	49.3	62.3	56.5	63.1	46.0	55.1	52.6	56.2	40.8	48.5	52.8	56.6
Hydro Plants:																				
January	26.5	35.2	26.5	35.2	21.2	21.2	21.2	21.2	25.0	20.8	25.0	20.8	26.4	20.1	26.4	20.1	27.5	27.3	27.5	27.3
February	30.1	46.5	26.8	35.6	20.1	20.6	20.7	20.9	24.1	20.6	24.6	20.6	28.6	21.4	27.4	20.5	23.9	27.9	26.0	27.6
March	29.9	30.0	26.9	35.3	21.0	20.6	20.8	20.8	23.0	20.6	23.5	20.6	30.4	23.2	28.4	21.3	24.9	19.0	25.8	25.6
April	24.6	34.7	26.5	35.2	18.2	18.8	20.2	20.3	24.8	20.8	24.2	20.7	22.4	25.0	26.8	21.2	27.3	19.2	26.0	24.2
May	26.5	25.6	26.5	34.3	15.5	17.4	19.2	19.7	21.5	20.1	22.5	20.5	27.9	21.2	27.1	21.2	29.8	22.9	26.6	24.0
June	29.2	21.5	26.6	33.8	17.6	18.8	19.0	19.6	21.1	19.5	22.8	20.2	27.3	18.3	27.1	20.7	30.3	27.4	27.6	24.2
July	29.2	29.6	26.6	33.9	15.9	21.1	18.6	19.8	19.4	19.7	22.3	20.2	27.3	18.3	27.7	20.7	24.2	19.9	26.3	23.7
August	31.4	36.5	26.8	33.9	16.7	20.9	18.3	19.8	20.7	21.6	22.0	20.4	33.7	23.1	28.5	21.0	25.1	24.3	26.2	23.6
September	31.4	32.2	26.8	33.4	16.0	19.9	18.1	19.9	20.8	21.1	21.9	28.7	27.6	20.2	28.4	20.9	23.4	22.8	25.9	23.6
October	32.0	32.0	26.8	33.4	17.8	22.9	18.1	20.2	20.3	18.1	21.6	20.2	30.0	21.0	28.4	20.9	26.4	23.6	25.9	23.6
November	31.0	31.4	26.8	33.4	16.4	22.1	17.9	20.5	20.9	19.2	21.6	20.1	33.7	26.3	29.0	21.5	25.6	24.6	25.8	23.7
December	30.8	34.3	29.2	33.4	23.4	29.9	18.4	21.8	16.5	27.2	21.3	27.5	33.8	28.3	28.9	21.5	27.9	29.1	26.2	24.6
Combined Systems of Steam and Hydro Plants:																				
January	45.3	53.5	45.3	53.5	43.5	45.8	43.5	45.8	39.5	38.6	39.5	38.6	38.6	46.6	38.6	46.6	35.2	45.6	35.2	45.5
February	44.3	60.0	44.7	58.8	41.8	41.9	42.6	43.8	42.4	49.8	41.9	48.2	41.7	39.6	40.5	42.0	39.6	43.8	37.4	44.7
March	49.7	53.8	47.3	56.0	39.7	47.3	42.0	45.3	41.5	46.0	41.8	47.3	38.6	39.2	40.2	41.2	36.4	39.7	36.9	43.0
April	46.6	48.5	47.1	53.5	42.9	43.9	41.9	44.8	45.0	48.3	42.7	47.5	43.6	48.6	40.7	42.8	37.0	36.8	37.0	41.0
May	49.2	48.5	47.6	52.3	39.8	44.2	41.4	44.7	47.0	52.8	43.7	48.8	40.7	39.6	40.6	42.2	35.0	38.3	36.4	40.3
June	58.5	56.5	49.6	53.2	42.3	45.8	41.6	44.9	50.1	62.2	45.0	51.6	45.1	44.8	41.3	42.7	38.8	44.3	37.0	41.1
July	56.1	63.2	50.5	54.7	42.6	51.3	41.7	45.8	51.6	64.4	46.0	53.9	53.6	45.3	41.4	42.8	35.4	43.1	36.8	41.5
August	60.6	62.7	51.9	55.8	46.5	49.0	42.3	46.2	51.2	64.5	46.6	55.5	45.3	50.0	41.9	43.8	36.8	43.5	36.7	41.8
September	62.9	65.5	53.4	57.3	47.4	50.6	42.9	46.7	51.2	62.6	46.9	56.3	45.0	47.3	42.2	44.2	38.3	47.7	36.9	42.5
October	59.3	67.9	54.2	57.4	47.5	47.8	43.4	46.8	47.3	60.5	47.3	56.9	46.3	52.5	42.7	45.3	37.4	42.7	37.0	42.5
November	51.6	51.6	53.9	56.7	42.9	51.6	43.3	47.5	42.3	57.0	47.2	57.0	48.3	51.3	43.3	45.9	41.9	44.6	37.3	42.8
December	52.4	43.8	53.8	55.8	44.3	53.4	43.4	48.1	43.6	57.6	46.9	57.0	48.0	44.3	43.8	45.8	47.0	43.1	37.9	42.8

section was the only one reporting an increased output over November.

During December industrial plants in the North Central States were operating at between 65 and 70 per cent in the aggregate. Some large users of central-station energy were operating at greater capacity, but with the possible exception of aluminum plants, few if any plants were operating at full capacity. The output of the central generating and distributing companies of this section was slightly below that of the month of November in spite of the increased lighting requirements during the first portion of the month and new lighting customers that were added to the lines during the month.

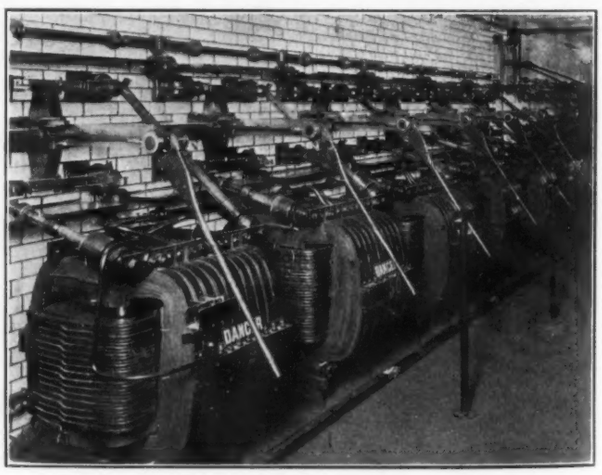
INDUSTRIAL SLUMP IN SOUTH CENTRAL SECTION

Industrial activity in the South Central States experienced considerable curtailment during December. Textile mills decreased production, steel-plant operation showed recession, and the lumber industry was operating at only about 35 per cent capacity. In spite of the seasonal increase in lighting requirements and new customers, the central-station output of this section was about 5 per cent under that reported for the month of November.

A further decline in activity was also reported by virtually every industry of the Mountain States during December. Several of the large consumers of industrial energy in this section, such as the canning and sugar industries, had practically ceased operations owing to the close of the season. With the exception of the lumber industry, a decline was also experienced throughout the Pacific Coast. As a result of these adverse conditions, and notwithstanding a substantial increase in lighting requirements and new customers, the Mountain-Pacific section as a whole reported an average daily electrical output almost 200,000 kw.-hr. below that of November.

Thirty-Year-Old Transformers Still in Service

PART of a group of 10-kw., 2,500/10,000-volt, single-phase transformers installed in April, 1891, and still in operation are shown in the accompanying illustration, which was recently sent to us by Ferranti, Ltd., Hollinwood, Lancashire, England. It is particularly interesting in showing the type of transformer construction, switch mechanism and bus arrangement installed more than thirty years ago. As may be seen, the transformers are of the shell-type, air-cooled, and without any cases. The buses are connected with the transformers through mechanically operated disconnecting switches. The levers projecting over the tops of the transformers operate the disconnecting switches simultaneously. Even in those early days buses were equipped with sectionalizing switches.



THIS EQUIPMENT HAS BEEN OPERATING SINCE 1891

Letters from Our Readers

This is a readers' forum. Comments on questions before the electrical industry presenting economic, financial, engineering or commercial aspects and new or supplementary viewpoints on published articles are cordially invited

Pulverizing Anthracite Coal Is Practical and Economical

To the Editors of the ELECTRICAL WORLD:

The article by E. B. Powell appearing in the Feb. 11 issue of the ELECTRICAL WORLD upon the subject of "Pulverized Coal as a Power-Plant Fuel Past Experimental Stage" has undoubtedly been received with more than ordinary interest, coming as it does from an engineer of Mr. Powell's standing. Mr. Powell states at the beginning that there have been no new installations or developments of a radical nature or of particular striking importance this year. As far as published or general information is concerned, he is right, although there are two installations which are of "striking importance" in that they are actually pulverizing anthracite coal with efficiencies that compare favorably with those pulverizing the much softer bituminous coals. We must therefore take exception to that part of Mr. Powell's article in which he states that no commercial pulverizer has yet been able to handle the harder grades of anthracite economically.

That pulverized anthracite coal has not been used to any extent has been due primarily to the pulverizer. While most bituminous coal pulverizers are economical, when they are used for pulverizing anthracite their principle of operation is such, and the abrasion of anthracite coal is so severe, that the parts are worn out in a very few weeks, and the cost for repairs alone ranges anywhere from 30 cents to $1 per ton of anthracite coal ground. On the face of it this eliminated the use of high-speed pulverizers on the harder grades of anthracite.

About two years ago we were approached on the problem of pulverizing anthracite coal, with the warning that the particular coal to be ground was so hard that almost any piece would cut glass. Having our successful experience with harder materials such as silica, carborundum, slag and other abrasives in mind, we undertook the problem. The only difficulty which arose was in choosing a satisfactory separator to obtain the fineness desired, for in our previous operations the mills were never required to produce the tonnage of fine dry product that is now required. Several methods of obtaining a uniformly fine product were tried, two of which have proved eminently satisfactory and show without question that the mill recommended can accomplish this work at a total operating cost far below that orginally expected either by the user or ourselves.

The action of the mill is such as to prevent excessive abrasion of the apparatus. As a matter of fact, one mill which has been in operation more than one year showed, upon inspection, that only one side of the lifter bars was worn. It was estimated that the lining would last at least two years longer. This mill had been pulverizing anthracite culm having an ash content of 25 per cent to 30 per cent, which is considered to be the hardest anthracite in the East.

When grinding this coal so as to allow 90 per cent to pass a 200-mesh screen, the foregoing mill required 30 hp.-hr. per ton of coal ground. This included the energy required to run the air separator and other minor apparatus operated in conjunction with the mill. Hence the figure may be taken as the total energy required to pulverize the hardest-grade coal in this country.

In another case, where anthracite river coal is being ground, the mill works in conjunction with an electrically vibrated screen. The coal contains about 18 per cent ash, and although not so hard as the culm just mentioned, it is much harder than bituminous. In this case the energy consumption, including all auxiliary apparatus, does not exceed 20 hp.-hr. per ton of coal ground to allow 90 per cent to pass a 200-mesh screen. These figures compare very favorably with grinding bituminous coal. In fact, they are even better than many results obtained in the latter field.

With the millions of tons of anthracite culm and river coal available and a satisfactory method of pulverizing and burning assured, it is only a matter of time before this fuel will be pulverized and burned with efficiencies as high as those obtained for the highest grades, either by shipping the coal to the central station for pulverizing or by locating a station near the source of supply.

The Hardinge Company, HARLOWE HARDINGE,
New York. Vice-president.

Eliminating Hum on Telephone Lines

To the Editors of the ELECTRICAL WORLD:

Replying to E. P. Peck's query in the ELECTRICAL WORLD of Feb. 11, I may state that I have found, after several years of experimenting, that the most satisfactory way of getting rid of the hum on wired telephone lines due to transmitting harmonics in nearby transmission lines is by using the "Wonder-phone" equipment, manufactured by the Universal High Powered Telephone Company, Inc., Seattle, Wash. At the present time I am using a number of this company's transmitters, which transmit a current of 2½ amp. as against 0.25 amp. in the standard commercial telephone transmitter.

A special transmitter permits the use of this high current and makes it possible to talk over any length of line up to a distance that would require the circuits to be balanced and repeating coils used; that is to say, a distance of from 300 miles to 400 miles. The person receiving the conversation can hear what is being said without placing the receiver to his ear, and sometimes it can be heard distinctly 24 ft. from the receiver. Of course, this is too loud and is disagreeable to the person listening; therefore a small shunt rheostat is used across the incoming telephone line and convenient to the operator which shunts out enough of the incoming message to reduce it to a pleasant amplitude. When this is done properly all of the hum is lost or shunted out, as the voice is so many times greater in volume than the hum. Both voice and hum are reduced equally with the shunt rheostat, and the hum is virtually lost.

Owing to the simplicity of this arrangement, it is easily adjusted, and the absence of delicate electrical apparatus makes it satisfactory. G. A. ILER,

Superintendent Operation, Tests and Repairs.
Georgia Railway & Power Company,
Atlanta, Ga.

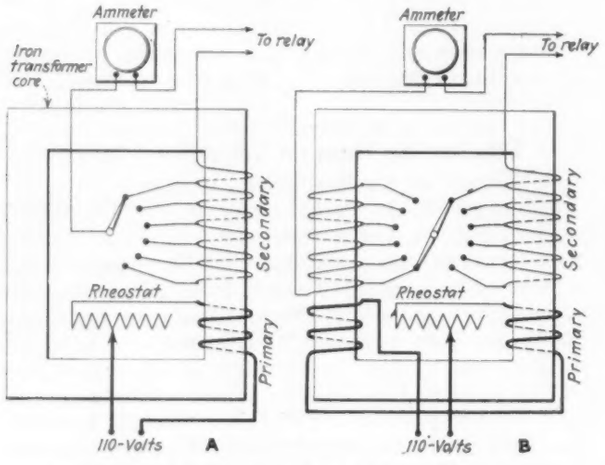
Industrial and Station Practice

Installation, Operation and Maintenance of
Generating and Distribution Equipment and Economical Utilization of Electrical Energy
in Mills and Factories, Including Testing and Repair Methods

Relays Affected by Wave Form

ALTHOUGH most instruction books on induction relays contain only an inconspicuous note saying that the relays are "slightly affected by variations in wave form and frequency," this variation may produce an error as much as 100 per cent under certain conditions. A striking example of this was recently encountered by the writer while testing some relays on a 25-cycle and 60-cycle radial system.

The testing practice followed was to disconnect the relays from the transformers and supply a phantom current from a small step-down transformer. This transformer had a 110-volt primary and a secondary with taps so arranged that they would give 6, 8, 12, 20, 40



EXTRA TURNS ADDED TO 60-CYCLE PHANTOM LOAD BOX TO MAKE IT GIVE TRUE WAVE SHAPE ON 25 CYCLES

and 80 amp. on the relays with but slight adjustment of the rheostat, as shown in *A*.

The relays were tested in the regular manner, put back on the lines, and set for a definite minimum time of two seconds. Soon after this a fault occurred and it was found that the relays on the 25-cycle portion tripped entirely too quickly. The 60-cycle relays, however, gave the correct time delay. They were again retested and again put back, but the next disturbance again tripped too quickly on 25 cycles.

A different tester then tested the relays, using a load drawn directly from the circuit instead of a phantom load. He found that the actual time on the 25-cycle relays was less than one second. This naturally caused an investigation into the phantom load, although it was pointed out that the 60-cycle relays were tested with exactly the same equipment and gave the correct time. The investigation disclosed the fact that while the primary of the transformer took only about 0.3 amp. from a 60-cycle circuit, yet it drew a magnetizing current of 17 amp. from a 25-cycle circuit. This resulted in a very flat-topped wave in the relays, a decreased torque and increased time.

After the transformer had been equipped with another coil, as shown in *B*, the magnetizing current was reduced to its proper value and the phantom current produced exactly the same time element as the regular load current.

The ammeter used was also of the induction type, but it did not contain any saturation transformer as in the relay. This indicated that this type of ammeter is not affected by variations in wave form. V. H. TODD.

Summit, N. J.

Suggestions on Rebabbitting Bearings

IN CHOOSING metal for rebabbitting bearings careful consideration should be given to the work that is expected of it, because a metal which might give good service on a low or medium-speed shaft, or where the work is steady, would soon go to pieces on a crank or wrist pin, or any place where it would be subjected to a constant shock. On such a bearing a tough babbitt should be used, one having tin for a base. A good proportion is 89 per cent tin, 7 per cent antimony and 4 per cent copper. A bar of babbitt metal that can be bent back on itself, cold, without cracking, shows toughness, will not dent easily and will ring when struck with other metal should be about right. In general the engineer is safe in buying metal of a reliable make, if the purpose for which it is intended is stated.

Where there is much rebabbitting to be done, it is well to have several mandrels of different sizes on hand, as they will save time. Before pouring bearings care should be taken to clean the shells thoroughly of all grease, dirt and particles of old babbitt and prepare them for pouring. After placing the necessary liners, the two halves of the shell are clamped or wired together, set on the board and centered on the wooden form. A wooden plug is fitted in the oil hole, if there is one; fireclay is banked around the end of the bearing resting on the board, and a dam of clay is made around the top end. In a clean melting pot, or a ladle large enough to hold sufficient metal to pour the bearing, put the babbitt, and while it is melting heat the shell with a blowtorch. The old rule (which I think is as good as any) says that when the metal is hot enough to blacken a pine stick it is hot enough to pour. Remove the dross from the top of the metal and pour quickly. In a few minutes the wooden form can be easily driven out, and if the job has been well done, it will show a smooth, even surface, ready to be bored or scraped to size. It sometimes happens in the manufacture of babbitt that particles of copper and antimony amalgamate into what are called hard points. These are no larger than pinheads and are as hard as steel. If they come to the surface, as the babbitt wears down, they are sure to score the shaft or pin. If the crank pin and wrist pin are round and in line, and if the boxes are fitted "brass and brass" and

keyed up rigid in the strap, they will give better service and eliminate "sidelash." However, space is usually left between the brasses to facilitate keying up lost motion as the babbitt metal wears away.

Camden, Me. M. M. BROWN.

Automatic Station with "Supervisory Control" System

AN ADAPTATION of printing telegraph apparatus is to be employed by the Malden (Mass.) Electric Company to control its automatic feeder stations from the load dispatcher's office in Malden. This system of remote control with a return signal is known as the distributor system of supervisory control. It is reported that this is the first time that equipment of this kind has been used in this country in connection with standard automatic station control and switching equipment.

The purpose of the distributor system of supervisory control is to give at all times an indication to the load dispatcher of the position of all oil circuit breakers on the system while allowing him at any time by means of control keys to make such changes in the switching set up as may be necessary. There will be only four pilot wires between the dispatcher's office and the feeder station at Everett to control and indicate an ultimate number of fifty oil circuit breakers. It is also planned to use only four more pilot wires to control and indicate an ultimate number of twenty-five oil circuit breakers each in the Medford station and a future one.

The supervisory system is an adaptation of the motor-driven distributor which has been in use for a long time in connection with the printing telegraph. In the dispatcher's office by pressing a self-locking key corresponding to the oil circuit breaker to be closed a current impulse is sent by the distributor over one wire to the feeder station and there collected by a similar distributor and given to a polarized relay also corresponding to the oil circuit breaker to be operated. The polarized relay acts to close the circuits of the regular closing relays. To open the breaker the same key, thrown to the off position, causes a reverse impulse to act on the same polarized relay in the feeder station which acts in the reverse direction to open the switch.

In the feeder station an auxiliary switch on the oil circuit breaker selects the direct or reverse impulse and through the distributors acts on a similar polarized relay in the dispatcher's office, which in turn acts to light a red or green indicating lamp. A timing wire keeps both distributors in synchronism. The fourth wire is the common return. All wires will be standard telephone cable size.

In the Everett station there will be an initial equipment for 22,000-volt incoming lines, one bank of 22,000/4,000/2,300-volt transformers, three three-phase, 4,000-volt power circuits, one three-phase, four-wire arc-light feeder and four arc-light circuits. The high-tension lines will operate in parallel and will be protected by balanced reverse power relays which operate to trip the oil circuit breaker of the line in trouble regardless of the supervisory control. Differential relays protect the transformer bank and act to open and lock out the high-tension breakers. The three-phase power and the single-phase lighting-feeder circuits are protected by a standard reclosing relay scheme which allows only three operations in succession in case of trouble and then locks out. The arc-light circuits are protected by hand-operated oil circuit breakers which can be opened by the supervisory control. The ultimate equipment contemplates two 33,000-volt lines, two transformer banks and feeders to make up a total of approximately fifty oil circuit breakers.

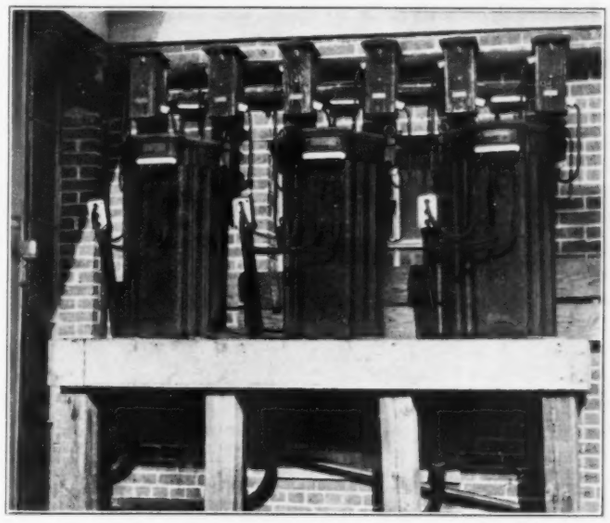
The unusually reliable service rendered by the Medford station automatic reclosing feeder equipment during the severe sleet storm in Massachusetts last November was, it was said, one of the factors governing the Malden Electric Company's decision to make its Everett station automatic and include in its plans automatic control for the projected station.

The distributor system of supervisory control with return signal is a development of the Western Electric Company, and the equipment installed was supplied by the General Electric Company.

New York, N. Y. FIELD EDITOR ELECTRICAL WORLD.

Space Saved by Mounting Lighting Transformers in a Corner

THREE 25-kva. lighting transformers are mounted on a platform at the side of a shop doorway to save space at the factory of the Northway Motors Corporation, Natick, Mass. The transformers are supported close to the building wall by a wooden flooring carried



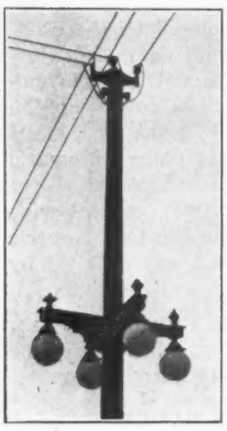
PRIMARY AND SECONDARY LEADS TO TRANSFORMERS MADE THROUGH CONDUITS

Above the transformers are expulsion-type primary cut-outs hung from conduit by strap-iron and angle braces.

on 6-in. x 6-in. upright timbers, the platform being of 2-in. x 9-in. stock, as is shown in the illustration. Cross-timbers of 6-in. x 6-in. section are run under the flooring and are fastened to the wall by 4-in. angles and to a window sill below the flooring by a 6-in. x 6-in. short post invisible in the photograph. All wiring is in rigid conduit, the 550-volt primary leads being brought out at the top from a service panel within the building through a horizontal conduit line from which short connections are made to sets of expulsion-type primary cut-outs hung from the conduit by strap-iron and angle braces, and thence to the primary windings. Each set of 110-220 volt secondary leads is run in a separate 2-in. conduit into the building as shown. The installation occupies no otherwise useful space and, although so near the doorway, is far enough above and at one side to present no inconvenience or hazard.

Boston, Mass. FIELD EDITOR ELECTRICAL WORLD.

Ornamental Lamp Standard Fed from Overhead Service



TO SAVE the expense of underground conduit to serve the ornamental street lamps in Trinidad, Col., the line wires have been run on short arms fixed to the tops of standards. From this the two series circuits enter the top of the standard through conduits. Thus two wires enter each conduit on either side of the standards. Inside the standards the wires run down to the brackets supporting the lamps, without the use of additional conduit, the pole itself serving as the conduit for the lighting circuit.

Cables for Mining-Locomotive Gathering Reels and Cutting Machines

THE life of electric cables used with gathering reel mine locomotives is so short and the troubles experienced with them have been reflected so seriously in the output of coal mines that an investigation was made not long ago to determine the causes of these troubles and what remedies could be applied to mitigate them. Not so much trouble is experienced with the cables used for cutting machines, but advantage was taken of the investigation to look into this service in order to find out just what the conditions were.

In order to accomplish this a number of coal mines were visited in West Virginia and Pennsylvania, where actual operations were observed and the question was discussed with mine superintendents, foremen and others.

In the first place, it was found that single-conductor gathering-reel cable is used almost exclusively in the Logan fields, apparently on account of its cheapness, while two-conductor flat and two-conductor concentric cable is used in Pennsylvania. The choice of the type to use in a given district seemed to be governed mainly by custom or tradition. However, the causes of trouble and the corrective measures are the same with all three types.

The principal cause of the deterioration—or perhaps, more accurately, the destruction of gathering-reel cables—is from their being run over. Very often the cable catches on something or becomes tangled up in some way, with the result that it does not wind up properly on the gathering reel and is run over by the locomotive. Then, of course, a splice is necessary, and this makes a thick spot which is quite likely to catch in the guide on the spooling device of the reel and cause it to be run over again.

One of the most frequent causes of catching in the guides is slipping of either the rubber insulation or the braid, or both, from under the tape applied at splices. This slipping of the rubber and braid, even if it does not interfere with the action of the reel, sometimes leaves a spot of bare copper which is quite likely to cause a short circuit to the side of the reel, not only damaging the latter, but often burning the reeled-up portion of the cable so badly that it has to be replaced. Other causes of trouble are cracking of braids and insulation from kinks, or the constant winding and unwinding on the reels and occasionally breaking of the strands due to the same causes, resulting in pierced insulation with consequent short circuits or grounds. Grounds or short circuits also occur if poorly spliced cables or cable with cracked insulation lie on moist ground or in water.

Cables are usually discarded when the splices become too numerous. Examination of junk piles near the mines disclosed many cables with very frequent splices.

Another interesting fact shown by the junk piles was that the outside braided coverings were rarely damaged enough by abrasion to cause the cable to be replaced for that reason. One might quite naturally expect that the wear and tear on the braids would be one of the most serious causes of trouble, but as a matter of fact the cables are not actually drawn along the ground to any great extent.

The life of gathering-reel cables varies from two weeks to one year, the average being only about four to six months under full production.

While it is obviously impracticable to make a cable which can withstand being run over by a locomotive, it is nevertheless possible to design it in such a way as to reduce to a minimum many of the causes contributing to such mishaps. The following suggestions for the construction of gathering-reel cable are therefore made with this in view.

PROPER CONSTRUCTION

Stranding. — In order to secure the proper degree of flexibility, it is necessary to strand the copper conductors, but it must be borne in mind that if the cable is too flexible, there is danger of tangling. Experience indicates that with two-conductor flat cable each conductor should consist of forty-nine wires; with concentric cable, sixty-one wires (inside conductor), and with single-conductor cable, 127 or 133 wires, the former figure being for concentric stranding and the latter for rope stranding.

Insulation.—The standard rubber insulating compound specified by the Fire Underwriters in the National Electrical Code is fully adequate as regards life and flexibility. The compound should, however, be applied to the conductor in such a way as to adhere very tightly to prevent slipping. Ordinary code wire such as is used in buildings and for other purposes is often not sufficiently adhesive. Tightly adhering insulation also reduces the liability of cracking.

Braids.—Two ordinary weatherproof braids are required which should also adhere very tightly. The braids on ordinary wire do not sufficiently meet this requirement. Very heavy braids are generally called for because, as has already been pointed out, the conditions of service do not, except under special circumstances, entail very serious abrasive action on the cables.

Braids should be saturated with the usual weatherproofing compounds to strengthen them mechanically and prevent rotting.

The smooth, waxy finishing compound which is ordinarily applied to the braid of house wires after weatherproofing to facilitate drawing them into conduit, while attractive in appearance when new, is hardly worth while for gathering-reel cables.

With two-conductor flat cables it is desirable from the standpoint of safety and convenience to provide a raised thread in the braid of one conductor so that the two conductors can be distinguished from each other in the dark by touch and thus indicate which conductor is connected to the live and which to the grounded (track) side of the source of power.

Concentric cable is usually made with rubber insulation over the outer conductor, but this is sometimes omitted and the cable merely covered with weatherproof braids, because it is customary to connect the outer conductor to the

grounded side of the circuit. The omission of this insulation is a dangerous practice as the outer conductor may be inadvertently connected to the "live" side of the circuit, and as had happened at one of the mines visited, a man might be killed by taking hold of a cable under such conditions.

In the Logan district, where single-conductor cables are used on the locomotives, two-conductor flat cables are used for the cutting machines. In other districts the same cable is generally used for both cutting machines and locomotives.

The service conditions for cutting-machine cables are much less severe than with locomotives as these cables are not nearly so likely to be run over. The principal source of damage to them is from being stepped on and from tools and lumps of coal being dropped on them, which is mainly injurious to the rubber insulating compound.

Although the life of mining-machine cables is longer than that of gathering-reel cables, being about two to three years, there is nothing about the service requirements which would indicate the necessity of a better or more expensive specification than that already given for locomotive cables. In fact, it is regarded by many mine superintendents as extremely undesirable to have two grades of cable in a storeroom, especially where the same general type is used for both cutting machines and locomotives.

F. A. WESTBROOK,
Field Engineer.
Habirshaw Electric Cable Company,
New York, N. Y.

Installing Engine-Type Generators with Limited Equipment

SOME erecting engineers who read the instructions for installing engine-type generators published in ELECTRICAL WORLD Jan. 28, page 187, have pointed out that an A-frame or gin pole is not always available and that a single-screw jack is the only lifting device that can be readily obtained. While the extra time and expense required to install heavy apparatus under such conditions will usually justify the hiring or buying of the necessary handling equipment, instructions for installing a generator with limited handling accessories will be given for the benefit of engineers who find themselves in this predicament.

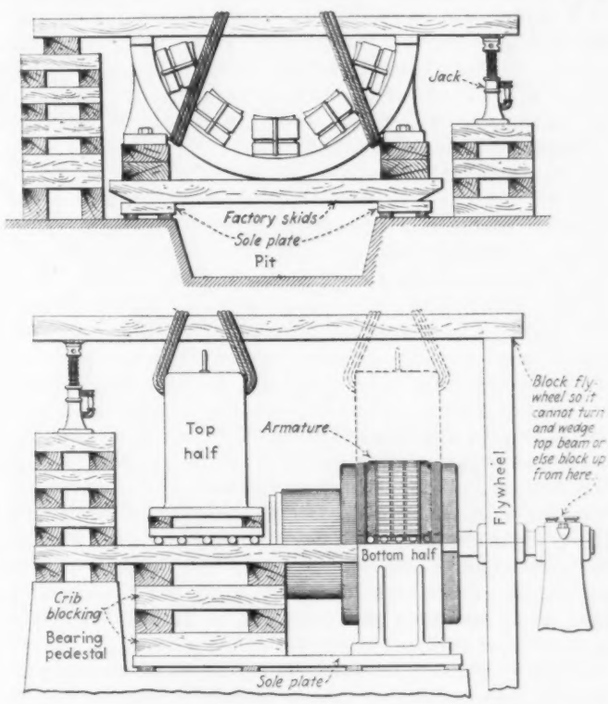
It is assumed that the foundations and space for the generator have been checked, that the center line of the shaft has been established, and that the sole plates have been laid on the foundations with a 1-in. board under each corner ready to receive the lower field frame.

Lay a timber across the field frame and lash it tight with rope. By using the jack first on one end and then the other, as shown by the sketch, it can be lowered slowly but safely. Leave the field setting against the side of the pit furthest from the flywheel so that when the armature is rolled out of its crate (on two timbers) it will not be necessary to raise it higher than just enough to let the commutator clear the field frame.

The engine man generally looks out for the bearings. Fill the bearings with small, clean blocking; then lay two timbers, one for each end, on top of bearing housing. The other end of the timber should be placed under the armature shaft, which must be jacked clear of the crate. Before doing this clean off carefully all paint and grease and look sharply for marks and dents in the parts of shaft that rest in the bearings. Then take out one side of the crate and roll the armature, now resting on the timbers, out of the crate over the bearings.

With the one-screw jack raise the end of shaft enough to pull out one of the timbers, then the other, and lower one end at a time, but always keep the blocking underneath so that it cannot drop more than a couple of inches should anything happen. While the engine man is leveling the shaft, slide the bottom of the field over the bolt holes, start all four bolts and center them in the holes by shifting the sole plate. Raise the field frames enough to insert ¼ in. of liners, let it down with the sole plates as one piece, set on wedges with the proper air gap, and center so that very little adjusting will be necessary after the top half is on. Tighten up the foundation bolts and have a wedge close to each bolt so as not to spring the sole plates.

To place the top half of the field build a crib high



INSTALLING GENERATORS WITH BLOCKS AND JACK

enough to permit the field to be rolled over the shaft close to the commutator. With the screw jack rigged as shown in sketch, make a lift to allow the removal of the skid, and then lower by degrees until there is just space under the frame for three or four small pipe rollers. Roll the frame over the lower half, make another lift, take out the rollers and lower again, but notice first if the joint bolts will enter the holes or if the field coils are in the way. If so, the bolts must be put through the holes before lowering.

In erecting an alternating-current machine proceed about the same way as for a direct-current machine, but do not attempt to line or level the stator until after the joint coils are in place, to save handling them more than once. While the engine man is leveling the shaft with the rotor on it, the coils can be installed. Never attempt to slide the stator or field frame while it is resting on the lifting screws or jack bolts as the screws will either bend or cut a heavy groove in the sole plates.

JAMES DIXON.
Reliance Electric & Engineering Company,
Cleveland, Ohio.

Management and Policy

Embracing Central Station Commercial Organization and Management, Customer and Trade Relationships, Public and Financial Policies, Advertising, Selling and Service Methods

Maintaining Day-Service Standards in the Small Community

A Suggestion from Charles McGee Adams on a Vital Factor Affecting Appliance Popularity and Good Will for the Central Station

WITH the steadily increasing interest in appliances being displayed by the central-station company and the growing appreciation of their value as load, there is a point of nearly fundamental importance which deserves serious consideration, particularly by companies serving the smaller towns, and that is that the foundation of any profitable load of this sort is adequate and reliable service during daylight hours.

In the cities and larger towns service in the daytime has been maintained at even a higher standard, if there is any difference, than at night, because of the increasing volume and importance of the industrial load. But in the smaller towns the industrial load is insignificant. The bulk of consumption comes from the lighting load, and as a result daylight service, when available, is often subject to interruptions and voltage fluctuations. Yet it should not be difficult to see that the quickest and surest way to discourage the use and sale of appliances is to have service fail when they are to be used.

A certain town in southwestern Ohio permits a severe pumping load that could easily be shifted to late evening to come on during the day. A man in this town has the most complete electric home in the county, but his equipment is useless much of the time, and dealers find themselves seriously handicapped in selling electrical devices because of the character of the service.

In another town linemen refuse to work on hot primaries, with the result that whenever a transformer is to be cut in, a pole set, or any other routine work done, service is cut off and remains off till the work is finished, while flatirons grow cold, vacuum cleaners stop and refrigerators heat up. Still another town, a rural hamlet, is served by a single 5-kw. transformer fed from a high-tension line, and two-wire services from the transformer are run a half mile in No. 10 wire. This answers tolerably for lighting load, but it is scarcely necessary to say that housewives find that their irons will not heat.

Of course, there are many small towns whose service is maintained at the same standards as in the large cities, but at the same time there are too many small towns like those just cited where daylight service is admittedly inferior to that supplied at night simply because the local company tolerates this condition.

At present the appliance load on the lines of these utilities may not be large enough to be profitable. In all probability it is not, with service conditions as they too often are. But if experience is any guide, there is every reason to expect that it will grow into something even larger than the lighting load, provided it has the foundation of proper and reliable daylight service.

The very best appliances are useless without an adequate energy supply. In the small towns and outlying villages these conveniences are doubly valuable to the user. But because he happens to live in a small town it does not seem reasonable that he should have to put up with an indifferent energy supply. Although the blame cannot rightly be placed upon companies whose service is up to standard, such service reflects upon the central stations as a whole. Many of these small towns are supplied by a private individual or a small local company which takes its energy from a nearby transmission line. In such cases the larger power company should make an extra effort to see that the distribution lines and other equipment are ample to maintain a high standard of service. Public good will and pleasant customer relations are based upon the quality of service rendered, and without this prime requisite no company can expect to grow and prosper.

A Business Boom for the Boston Electrical Family

ON FEB. 1 the Edison Electric Illuminating Company of Boston launched a campaign for new customers in which all employees are to be participants. Contractors and jobbers have also been asked to aid in the campaign which will be mutually helpful. It is expected that before the end of the year at least one new customer per employee will be added to the existing lines. The campaign is to be under the supervision of the sales department, of which L. R. Wallis is the head. It is estimated that if each of the company's 2,300 employees secures a new customer, the house-wiring business resulting will amount to $287,500, and that of this sum 1,500 persons, representing contractors and their employees, will get $150,000, and 500 persons, representing jobbers and their employees, will receive $137,500.

BIG BUSINESS BOOM!
BEGINNING WEDNESDAY, FEBRUARY 1st, 1922
WILL BE STARTED, THE BIGGEST THING IN AN
EDISON
EMPLOYES' CONTEST
Each employe to get at least One New Customer
ON EXISTING LINES.
BIG THING IN OUR INDUSTRY
SEE WHAT IT WILL MEAN:
That's going Some. We'll tell the World!
EVERY EMPLOYE IS IN ON THIS!
10-Big Special Prizes-10
Have You Read "The Go-getter"? See February "Edison Life."
BUSINESS BOOM COMMITTEE
THE EDISON ELECTRIC ILLUMINATING CO. OF BOSTON

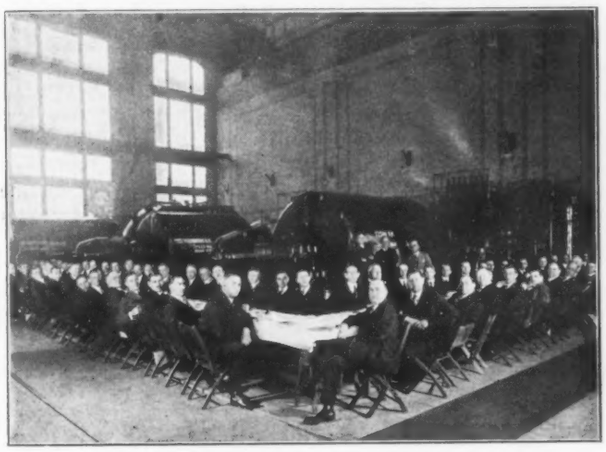
POSTER ANNOUNCING EMPLOYEES' CONTEST

In announcing the campaign L. D. Gibbs, superintendent of the company's advertising department and sec-

retary of the newly formed "business boom" committee, stated that no such campaign has ever before been attempted by a central-station company. Every bureau head, department and division head is "in on" the campaign, as well as the rank and file of employees. Ten special prizes will be awarded employees outside the commercial departments who obtain the largest numbers of new customers.

Showing What's Back of the Company's Service

THIS picture of the members of the Lions' Club of Dayton, Ohio, guests of the Dayton Power & Light Company at a luncheon, was taken in the turbine room of the company's Miller's Ford station. The club members were taken to the plant at noon by automobile and conducted through the station in groups of ten under the guidance of an employee of the company who explained the principal features of the various pieces of



LIONS' CLUB LUNCHEON IN DAYTON COMPANY'S MILLER'S FORD STATION

apparatus. The luncheon was presided over by O. H. Hutchings, vice-president and associate general manager of the company.

The Dayton company for years has consistently endeavored to maintain the public interest in its property and its affairs by telling the people both its sorrows and its joys and by taking advantage of every opportunity to exhibit and explain the system to the business men of the community. Contact with civic organizations has been the source of many helpful friendships and visits of inspection to the plant have been made a feature of get-together meetings with different local bodies that have aided materially in the upbuilding of a high degree of public confidence and appreciation.

Selling $11,300 of Stock Daily for 2,300 Days

IN A LITTLE less than 2,300 working days the Pacific Gas & Electric Company of San Francisco has sold $26,068,000 of its first preferred stock. It was almost eight years ago when this company first offered its preferred stock directly to its customers and employees. Since the initiation of the plan on June 3, 1914, sales for every working day have averaged over $11,000. These results are the more noteworthy when it is considered that during the war period the company discontinued its efforts to sell stock and that it did no advertising from the time the United States entered the war, in April, 1917, until the latter part of October, 1920, or for a period of more than three and a half years.

In the accompanying table the number of sales and

SALES TO CONSUMERS OF FIRST PREFERRED STOCK.

Year	No. of Sales	Par Value of Stock Sold
1914	3,739	$8,801,300
1915	1,712	3,785,100
1916	617	1,123,100
1917	650	890,000
1918	192	156,000
1919	52	35,900
1920	3,669	3,634,650
1921	6,399	7,491,550
1922 (to Jan. 13)	163	150,400
Total	17,193	$26,068,000

the par value of the stock sold are given, and it is an interesting fact that in this period the company's list of stockholders has increased from 3,000 to 18,000, of whom more than 15,000 are residents of California. One of the features of the company's stock-selling campaign is the remarkably low sales expense. In a period from June, 1914, to November, 1921, inclusive, the average selling cost per share for direct sales aggregating $25,662,600 was only 89.1 cents, and during the last active campaign in the interval from July, 1920, to Nov. 20, 1921, inclusive, $10,871,200 par value of stock was sold at an average cost of only 70.7 cents per share.

What Other Companies Are Doing

Wichita Falls, Tex.—Thirteen electric ranges were sold recently in two weeks' time by the commercial department of the Texas Power & Light Company in this district. These range sales were made in the face of cheap natural gas and adverse financial conditions.

Charlotte, N. C.—A significant index to the increased understanding by the public of the value of electric service is shown in the 3,285 new customers added to the lines of the Southern Public Utilities Company during 1921. Of this number 2,400 were residential customers and the remainder, 885, were commercial and industrial users.

Central Maine. — During the first three weeks of 1922 eleven of the branch offices of the Central Maine Power Company sold a total of $6,214 worth of electric appliances. The list of sales includes curling irons, flatirons, grills, heating pads, portable lamps, radiators, toasters, vacuum cleaners and washing machines. A bogie for 1922 sales has been set for each district office of the company, but some of the branch offices exceeded their year's quota in the first three weeks and it is expected that the present bogie will undergo a revision upward.

Vancouver, B. C.—During the year 1921 the British Columbia Electric Railway Company added 510 lighting installations to its Island system, increasing the connected load by 850 kw. The total number of lighting customers is now 15,400 with a connected load of 9,985 kw. Substantial gain has also been made in commercial power, an increase of 2,170 hp. in connected motor load being the result of the year's operations. The total horsepower now connected is 25,570. The company expects that still better results will be obtained during 1922.

Manufacturing and Distributing

Devoted to the Discussion of Production, Distribution and Market Development, the Business and Economic Problems of the Manufacturer, Jobber, Agent, Contractor and Dealer

Cost, Slow Turnover and Excessive Stock Duplication

By George A. Hughes

President Edison Electric Appliance Company, Inc., Chicago

IN THE processes of distribution throughout the electrical industry, volume of business and the varying cost of selling different articles are two vital factors whose relation to ultimate profit appears not always to be clearly understood. No doubt, during this readjustment period, electrical merchants, both wholesale and retail, may be finding the cost of doing business burdensome, as indeed has the manufacturer. But the answer is certainly not longer discounts, which would involve higher prices. The need is rather for setting the business house in order, facing the issues of reduced public buying interest and keener competition and keeping in mind the law of survival of the fittest, which will be found operating in the electrical trade as well as in other spheres.

G. A. HUGHES

It is highly important for the wholesale and retail branches of the electrical business to study and know their costs of doing business. But it is equally important that the proper interpretation be put on any figures or statistics which are obtained. Questions of distribution of overhead on varied lines, annual volume and rate of turnover, for example, are practical factors which seriously affect the result. Then, again, electrical appliances must be considered according to their proper classifications. For example, shelf merchandise, such as flatirons, should be distinguished from articles like washing machines and vacuum cleaners, as the latter require a different form of merchandising.

It so happens that in the distribution of electrical heating appliances our experience is not confined to the electrical trade, strictly speaking. For years these goods have also been sold through hardware stores, housefurnishing goods stores and department stores—old-established lines of business which know merchandising costs and merchandising methods and have survived in keen competition. These retail stores have been well satisfied to promote the heating-device business at discounts which have been in force without substantial change since the beginning of the business, and which are comparable to discounts of analogous lines and even better than many. In one of the most successful retail trades, I am advised that the average discount is 30 per cent.

The important factor of turnover is overlooked by many retailers. In an analysis of a retail dealer's stock recently made, with an inventory of $75,000, it was found that 80 per cent of the total turnover was done on $25,000 of the inventory. In other words, of his investment of $75,000 in merchandise he had $50,000 in slow-moving or frozen investment. From a merchandising standpoint there is no fundamental difference between electrical merchandise and other commodities. A grocer has a better profit on some articles than on others, but he finds it necessary and profitable to carry a complete line of goods.

It would be a serious matter to involve such investigations of cost with the matter of trade discounts and prices, because the latter involve such practical considerations as trade practice, competition, skill in merchandising, efficiency in operation, rate of turnover, volume of business, relation of the electrical appliance sections to other departments, business conditions and so on.

If a campaign for ascertaining selling cost is taken up in times like these, it should be associated with a campaign for lower costs and better merchandising if the average electrical dealer is to stay in the race. At the same time, one thing in particular which calls for better merchandising, and which has impressed me, is the unnecessary duplication of investment on account of the tendency to multiply various makes of the same kind of appliances, instead of confining the investment to and concentrating on one or two standard lines of appliances which have consumer demand and faster turnover.

A great work has been done in getting the electrical contractor to study and know his costs. This has led to a fairer basis of competition and has therefore had a stabilizing effect. But the matter of cost of merchandising is far more complicated, because the practical and varying elements affecting the figures, which I have indicated, and the electrical merchant's cost of doing business, must enable him to meet the competition of other merchants in established business.

Who Should Carry Through to the Consumer?

By J. P. Provost

Vice-president Union Electric Company, Pittsburgh, Pa.

MANUFACTURERS and jobbers of the larger household appliances—that is, electric clothes washers and ironers, vacuum cleaners, dishwashers and ranges—sooner or later will be obliged to work out in definite shape a distribution process that will carry through to the consumer with the burden balanced to the opportunity and to the profit. But this business as yet has not been put clearly on such a basis. Some manufacturers are selling to the jobber and leaving the job from there on in his hands. Some are giving active and direct aid to the jobber in the further distribution

of their product. Some are selling directly to the dealer and assisting him. Some are carrying right across the usual channel and selling to the consumer only. Each, however, has the right to choose the method he prefers and work out his own experiment from which he would be enabled to establish a definite policy. But be the process what it may, some one must be clearly delegated to carry through to the consumer with educational advertising, personal selling and supporting service.

The majority of manufacturers have chosen the natural organized channel of the electrical trade, and I believe will continue to do so. There is need for warehousing these goods, for the development of retail outlets in many large and small communities, and for carrying the credit and education of the retailer, the pioneering of the appliance to the people and the financing of installment payments. It is a big job that somebody must do, but the work must be better scheduled and regulated so that the compensation will be proportionate to responsibility. Either the manufacturer must carry the entire burden and retain the entire profit, or he must rely upon the jobber for warehousing, allowing him a warehouse margin and carrying on the burden of dealer education and pioneering to the customer himself, or he must put the follow-through work flatly up to the jobber and give him a discount commensurate with the function he is to perform. Some jobbers went very heavily into this large-appliance business, building up a large trade outlet and developing a big installment sales business through their dealers. These jobbers believed that this was a very profitable business. After a time, however, an accurate analysis of the facts and figures proved that they had found it necessary to assume such a large part in the work of carrying through to the consumer that the business was in the end not profitable but expensive. They had not known it, just as jobbers today do not know it, because little by little they have taken on more and more of the marketing responsibility without proportionate increase in compensation.

It May Hurt, but It's Got to Be Done

O-O-O-O O-O-O
NEW BUSINESS WOODPILE
SELLING
WELL, STANDING THERE YELLING WON'T HELP A WEAK BACK! AND REMEMBER—IF YOU DON'T KEEP THIS KITCHEN FIRE GOING YOU'LL NEVER GET YOUR DINNER
He's been so used to just gathering up an armful and carrying it in that, naturally, it does come a bit hard at first having to swing the axe.

A BIT of homely logic that suggests the underlying need of the present business situation. Only hard work, earnest selling effort and persistent advertising will create markets and increase sales in times like these. From *Sales Management*.

This business is young and these facts have not yet come to light in many cases. Experience will gradually demonstrate the situation and the readjustment that is needed will be made. But how much better it would be if we could balance up these functions and the participation at once, avoid the handicap of uncertainty that is now hobbling the appliance business, and enjoy the full advantage now of the added impulse that will come to the sale of these devices when the distributers' responsibilities and profit stand out clear and sure.

There is a tremendous market for these large appliances, and it can be easily controlled and developed by the electrical trade if we get our machinery running smoothly and keep it so. Because they cannot compete with the electrical man's ability to service such appliances, the department stores will not be able to carry off this business unless we sacrifice it to them by bad management, and there is no reason why we should do this. But there is much bad management mixed with the business now, and it is none to soon to work it out.

Two Letters on the Small-Order Problem

AN INTERESTING sidelight on the small-order question which confronts manufacturers today is shown in this exchange of letters, names omitted, between a manufacturer and a jobber. The manufacturer's letter clearly states his problems, while the jobber's reply suggests the only practical solution. The manufacturer's letter reads:

(*Your order S-10 and S-15*)

GENTLEMEN—We note with regret that the small miscellaneous items that we have been receiving during the past year from you work a financial hardship, so far as we are concerned, though undoubtedly unintentional on your part. We appreciate that war conditions upset all of us, and we have stood in the breach even at an absolute loss. We, however, think that you would not expect us to continue to do so, as we must exist.

The above two orders, each calling for one bell-hanger's bit, are fair samples of what we have been getting. We have to be very careful in making shipments to follow your minute instructions, answer your "follow-ups," etc., which is very costly (we have the figures). Presume that the same conditions exist at your end of the line.

We, of course, are going to ship these two orders as directed and are writing to you frankly, as good old friends, to ask you to send us a little sweet along with the bitter. This retail business is a loser for us.

An expression from you as to what we may expect will be appreciated. Perhaps these little one-item propositions can be purchased in your own city to your advantage. We have sold the ..... Company for thirty-odd years and understand the situation exactly, and we believe that in sending us these small items you have not given the matter any thought, so we will forgive you.

With personal regards, we are very truly yours,

——— ———.

The jobber's letter reads:

GENTLEMEN—I received your letter of Dec. 1, also your letter of Dec. 8, regarding the small-order question, and quite agree with you that our pick-up privilege has been abused. We certainly should carry an assortment of the items in question, and I am pleased to inclose herewith a small order, which should eliminate so many pick-up-items.

This is a saving to ourselves as well as yourselves, and I want to thank you for bringing the matter to my attention.

Yours truly, ——— ———.

This practice of buying at wholesale prices in retail quantities has grown to a point where it cuts into the profits at both ends. It is largely a matter of habit. But the habit will only be broken when the manufacturer, jobber and dealer, each in turn, performs his part in ending it.

Digest of Electrical Literature

Including Brief Abstracts of and References to
Important Articles Appearing in the Scientific and Engineering Press
of the World

Motors, Generators and Transformers

Prevention of Transient Voltage in Windings.—J. MURRAY WEED.—Article relating to windings such as are used in transformers, reactors and the like, with particular reference to the characteristics which determine internal distribution of suddenly impressed voltages or sudden voltage changes and the resulting internal oscillations. After describing the production of these transient voltages in ordinary windings, the paper explains this phenomenon as due to faulty arrangement of inherent capacitance with the inductance of the winding. Methods of prevention are described for the ordinary windings, by supplementing the faulty arrangements of inherent capacitance with auxiliary capacitances or condensers. Methods are given for the construction of windings with the ideal distribution of inherent capacitance called for by this principle.—*Journal of the American Institute of Electrical Engineers*, January, 1922.

Possibilities of the Turbine.—P. F. COFFIN.—The efficiency limitations reached in the present-day steam turbines may be overcome by using two vapors in series, such as mercury and steam. Experiments carried out on a 1,000-kw. unit producing 1 kw.-hr. on about 11,300 B.t.u. are described in the article.—*Power*, Jan. 24, 1922.

Lamps and Lighting

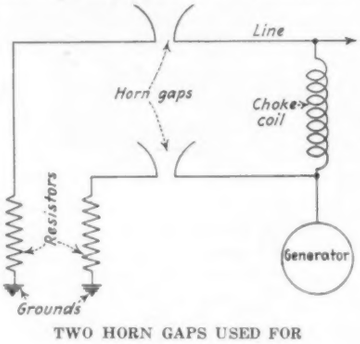
The Lighting of Public Buildings.—A. L. POWELL and EDGAR PARKER.—A thoroughly satisfactory building depends upon the preliminary planning of the lighting, simultaneously with the structural elements, and as public buildings in general are elaborate structures with special lighting requirements, the best results are obtained only when these features are carefully considered beforehand. A description is given of the lighting requirements of art galleries, museums, libraries, municipal, county and state buildings and banks.—*Transactions of the I. E. S.*, Dec. 30, 1921.

Generation, Transmission and Distribution

Power Factor Meeting of the V. D. E. in Essen.—MATTHIAS.—A number of valuable suggestions to overcome or at least to subdue phase displacement in large networks. For example, no oversized synchronous motors should be used. The air gap of these motors should be kept as small as possible, preferably by using ball or roller bearings for the shaft. Squirrel-cage armatures are recommended for all motors as high as 30 hp., and to avoid excessive magnetic leakage flux there should be a speed as high as possible, if necessary with the use of a reduction gear. If a motor operates for an appreciable length of time on low load, it should be changed from delta to star connection, which can be done with a simple switch. Synchronous motors may be used for as little as 30 hp. They have a commutator and may therefore also be used as converters. A combination asynchronous-synchronous motor was developed with a high starting torque. With the use of synchronous condensers care must be exercised to determine their most effective location on the network.—*Elektrotechnische Zeitschrift*, Dec. 29, 1921.

An Example of Transmission-Line Calculations.—R. D. EVANS and H. K. SELS.—This is the last of a group of four articles by these authors dealing with transmission-line problems. This article solves a general problem, which is to determine the most economical voltage and balance of transmission equipment necessary to deliver at a distance of 125 miles a load of 50,000 kw. per circuit whose power factor will average 85 per cent.—*Electric Journal*, February, 1922.

Protection Against Lightning.—E. POIRSON.—An interesting theoretical paper wherein, to aid in the proper design of arresters, the author tries to calculate the approximate energy in a lightning discharge. A cloud with a radius of 500 m., situated 400 m. above the ground, represents a capacity of 0.055 mfd. The earth capacity is assumed to be 700 mfd. A bolt from this cloud to ground may have a potential of 50,000,000 volts. Assuming an air resistance of 10 ohms and the self-inductance of the rectilinear distance of 400 m. to be about 0.00075 henry, the frequency of such a discharge would be 24,700 cycles per second. A total of about 69,000,000 joules would be liberated in such a bolt, and, assuming a thousandth of a second as the time of discharge, this would equal 69,000,000 kw. The author discusses simple arresters, consisting of arcing horns, choke coils or resistors, and their best combinations. He proves mathematically that the use of a single choke coil with a few turns is of little protective value and suggests a combination of two horns and one choke coil.—*Revue Générale de l'Electricité*, Dec. 31, 1921.



TWO HORN GAPS USED FOR LIGHTNING PROTECTION

Traction

Why Modern Motors Should Supersede Older Types.—J. M. HIPPLE.— The author tells how self-ventilation, together with the use of commutating poles, box-type frames, bronze bearings and improvements in mechanical and electrical design, has produced a motor for present-day service for electric railways.—*Electric Railway Journal*, Jan. 21, 1922.

Electrification of Chilean Railroads.—A seven-million-dollar contract provides for complete electrification of the first zone, which includes 144 miles of track between Valparaiso and Santiago. Thirty-nine electric locomo-

tives are required for the initial step, comprising six express passenger, eleven local passenger, fifteen road freight and seven switching locomotives. The express passenger and road freight locomotives will be equipped with the Westinghouse system of regenerative braking. Hydro-electric power will be used. When the proposed stations are complete they will have a rating of 120,000 kw.—*Electric Traction*, January, 1922.

Installations, Systems and Appliances

Increasing Welding Speed.—H. R. PENNINGTON.—The possibilities of increasing the speed of arc welding are pointed out in this paper, which was read before the American Welding Society in Chicago. Electric welding speed on a given section is dependent upon the rate of metal deposition and the amount of metal required to effect the jointure. Three tests on welding wire to determine the advantages of coated wire, using $\frac{5}{32}$-in. and $\frac{1}{4}$-in. wires, are given.—*Welding Engineer*, January, 1922.

New 7-Ton Heroult Furnace.—Description of a tilting furnace made by the American Bridge Company and different from its other standard type in that arrangements are made for the use of a mechanical charger. The lift of the electrode is extremely high, which allows the use of a mechanical charger without danger of breaking electrodes.—*Iron Age*, Feb. 2, 1922.

Electric Winding Engines and Mine Hoists.— H. H. BROUGHTON.—The author has collected a series of notes on the strength of helical gearing, with the idea of providing the user of such gears with data by which he can check the designs of the gearing manufacturers. The article is in two parts, the first dealing with typical calculations of the working load, with a chart for determining the horsepower rating of gearing in units. In the second article the properties of the various types of gears are described and compared.—*Electrician*, (*London*), Jan. 6 and 13, 1922.

Electrochemistry and Batteries

Formation of Fume Ions in Electrical Precipitation.—YASUJIRO NIWA.—Assuming that the fume particle and the ion are conductive spheres, the author derives the theory of formation of fume ions. He discusses the relation between the precipitation efficiency, the gas condition and the properties of particles and finally concludes that the high temperature of gas and the low conductivity of particles hinder the formation of fume ions and lower the precipitation efficiency. The author shows that the conclusions drawn coincide with the working data of the 180,000-cu.ft.-per-minute precipitation treater for gas at the Ashio smelter of Japan. —*Institute of Electrical Engineers of Japan*, January, 1922.

Units, Measurements and Instruments

Electrolytic Meter.—J. SCHALKHAMMER.—Much difficulty was experienced in Austria during and shortly after the war in obtaining a sufficient number of electric meters for new customers. A very simple and accurate meter was developed on the principle of the electrolytic meter. An iodine-mercury electrolyte is used between a mercury anode and a carbon cathode, both sealed into a glass vessel with an accurately calibrated measuring tube. The volume of this tube is so chosen as to be sufficient for one to two years, after which period the tube is reversed and emptied. The voltage drop of the meter is about one volt. Of course, the instrument is only an ampere-hour meter, but experience has shown that variations of the voltage settle quickly to the normal value and that, therefore, the absence of a voltage coil is not a serious drawback. The meters are very rugged and are unaffected by short circuits or by magnetic fields. The latter fact is of great importance for the electrochemical industries, where stray fields of 20,000 amp. to 30,000 amp. make the proper installation of a motor meter very costly.—*Zeitschrift für Elektrotechnik und Maschinenbau*, Jan. 15, 1922.

Telegraphy, Telephony and Signals

The Insulation of a Communication Line.—J. G. HILL. —A study of the important points of the resistance of insulators on communication lines.—*Post Office Electrical Engineers' Journal* (*London*), January, 1922.

Printing Telegraph Systems Applied to Message Traffic Handling.—A. H. REIBER.—This paper discusses some of the economic principles which determine the applicability of the automatic printing telegraph to present-day communication problems. Examples are given of the application of this type of apparatus to modern business conditions, and the fundamental fact is demonstrated that whenever speed is essential in communication consideration should be given to the automatic printing telegraph. The study is limited to those forms of light-traffic-load printing-telegraph systems which have been developed particularly for linking together factory departments, railroad terminals, branches of banks, or of other large corporations. A description is then given of the principle of operation of three systems, namely, the Morkrum "green code" system, the Western Electric "start-stop" system and the Kleinschmidt system.—*Journal of the A.I.E.E.*, February, 1922.

Miscellaneous

Proposed Regulation of Lake Ontario.—Studies by Canadian and United States government engineers for the International Joint Commission to determine the effect of the St. Lawrence River power development on the regulation of Lake Ontario.—*Canadian Engineer*, Dec. 29, 1921.

Federal Water Power Projects up to December, 1921. —The annual report of the Federal Power Commission (1921) shows that in the previous sixteen months there were issued 260 applications for licenses to develop water power under the federal water-power act, covering a total of 16,826,000 hp. of estimated installation. A table is given showing the hydro-electric power plants under way in the United States. This table gives the name of the company, name and location of the plant, dam and reservoir construction, pipe, canal and tunnel systems, maker, type and size of prime movers, static head, present stage of development and ultimate capacity of the plant in kilowatts. Among the companies are the Niagara Falls Power Company, Henry Ford & Son, Inc. (plant at Green Island), Alabama Power Company, Manitoba Power Company, Dearborn Plant of the Southern Power Company, Ruby Creek plant of the city of Seattle, Drum plant (unit No. 3), Hat Creek plants Nos. 1 and 2 and Pit River plant No. 1 of the Pacific Gas & Electric Company, Caribou plant of the Great Western Power Company, Kern River No. 3, Big Creek No. 8 and Big Creek No. 3 of the Southern California Edison Company. — *Engineering News-Record*, Jan. 5, 1922.

News of the Industry

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields With Announcements and Reports of Association Meetings and Conventions

Municipal Plants Seek Advantage of Interconnection

ACTIVITY in the construction of transmission lines is evidenced in Oklahoma, particularly lines to serve communities that have hitherto maintained their own municipal generating plants. A line from Skiatook to Pawhuska, it is stated, will take the place of improvements to the municipal plant at Pawhuska for which bonds had been voted. The improvements have been abandoned and franchises granted for the construction of the transmission line from which the power supply will be drawn. A new line has recently been placed in service which furnishes three municipalities with service from the Enid plant of the Oklahoma Gas & Electric Company. Three other municipalities have voted bonds for the construction of transmission lines to connect with the system of the same company, and some eight or ten other communities have opened negotiations with the same object in view.

The agricultural states, of which Oklahoma is one, are largely represented in the municipal service field by small plants that cannot hope for large growth. The happenings in Oklahoma are typical of the reports that are coming from these states and indicate that municipalities are awakening to the advantage of interconnection and the abandonment of old and inefficient plants.

Utilities Oppose Bills that Facilitate Municipal Ownership

VIGOROUS and comprehensive condemnation of measures now before the Massachusetts Legislature to make it easier for cities and towns to embark upon municipal ownership was expressed last week before the legislative committee on power and light at Boston by E. W. Burdett, counsel for the Massachusetts Gas and Electric Association. Following the recent failure of certain members of the Boston City Council to railroad a public-ownership scheme to success in connection with the Boston Edison company rate inquiry, several bills were introduced with the object of relaxing the legislative procedure necessary before public lighting plants can be established in the Bay State.

Pointing out how the present laws safeguard the community against intolerable duplication of overhead and underground systems, conserve regulated investment in plant and give time for sober second thought by the electorate after a municipal ownership agitation has got under way, Mr. Burdett emphasized the economic waste of competition in public utility service and showed how the present statutes have been evolved after long and serious study of the public-ownership problem.

A. E. Pillbury, for the Association of Massachusetts Gas Companies, also opposed the bills and stated that the purpose of setting up the original Gas and Electric Light Commission about a third of a century ago was to prevent competition in public service by substituting public regulation for ruinous rivalry of local utilities.

The committee has reported against proposed bills.

To Have Grouped Educational Exhibits at N.E.L.A. Convention

ONE of the features of the Atlantic City convention of the National Electric Light Association, to be held May 15 to 19, will be an educational electrical exhibition. The exhibition committee has issued its circulars and application blanks to the manufacturer members of the association, many of whom already have applied for space. All space will be assigned on March 15.

A new plan for using the Million-Dollar Pier at Atlantic City has been devised for this year's convention. As usual, the registration and convention committee rooms will be at the entrance to the pier. The ballroom will be devoted entirely to recreation purposes, and the exhibits all will be shown beyond the ballroom on the pier. At the end of the pier, beyond the exhibits, will be two rooms for the sectional meetings, while the theater will be used for the main convention sessions. Another meeting room has been built under the theater. Thus, for the first time, all convention facilities will be together on the pier.

In planning the exhibition the committee has arranged to have exhibits of similar products made in adjoining spaces. Among the important sections of the industry invited to co-operate in this way are those related to industrial heating, electric vehicles, incandescent lighting and wireless.

California Power Act Menace to Industry, Says Banker

THE proposed initiative amendment to the California constitution which will be voted upon in November and which would create a five-hundred-million-dollar state power bureau, is having a depressing effect on all California securities in the view of B. H. Dibblee, vice-president of E. H. Rollis & Sons and chairman of the California group of the Investment Bankers' Association of America.

"Generally speaking, the East has undoubted confidence in the future of California and in California securities, hundreds of millions of dollars of which have been distributed there. Unfortunately, however, a cloud has appeared on the California horizon, namely, the proposed water and power act," Mr. Dibblee said to a representative of the ELECTRICAL WORLD. "A few Eastern bankers have heard of the act, and I have been asked if California was going to emulate North Dakota, which now is shunned by all wise investors.

My reply was that the people of California are too sane to adopt any such radical measure.

"The fact that California has considered this measure will, when generally known, have a depressing effect on California securities. Its adoption would unquestionably result in the dumping on this market of millions of dollars' worth of California public utility and municipal bonds now held by Eastern and local investors. The proponents of the measure have apparently overlooked the fact that its passage would create such a mistrust of California as a conservative investment field that California securities would be looked upon as questionable investments, and that this mistrust would eventually cost the industries, utilities and municipalities of this state an incalculable amount, owing to the higher interest rates which they would have to pay for money in order to attract the capital necessary for the tremendous development which we all anticipate and desire. It is most unfortunate that this act should have been proposed, particularly at this time when the development of our state requires such large amounts of capital, a considerable portion of which must come from the East. The ultimate result of the policy upon which the proponents of the water and power act wish the State of California to embark may be seen in North Dakota, which has found it almost impossible to market its state bonds."

Severe Sleet Storm Visits Wisconsin and Michigan

DAMAGE that may run into several million dollars was done on Wednesday and Thursday night of last week to utility properties in southern Wisconsin and Michigan by a freak winter storm that ended with a sleet storm comparable to that in New England early this winter. The storm swept from the southwestern corner of Wisconsin toward the northeast and down the Fox River valley, the center line of the disturbance.

Wisconsin, Berlin, Appleton, Fond du Lac, Sheboygan, Green Bay and Manitowoc were among the communities suffering most severely. The transmission lines in the section suffered interruptions due to wire breakages. Important telephone toll leads were wrecked for miles and power and lighting distribution systems and telephone plants were badly damaged by ice, which is reported to have formed to diameters as large as 3½ in.

Communication had not been restored over some important lines early this week, and weeks will be required to restore even a semblance of service in some of the smaller properties. Reports at Madison on Wednesday of this week indicate that some of the smaller telephone and power companies may not be financially able to make the needed repairs. One or two cases of intention to discontinue service have been reported already.

Trees have been badly damaged and in many cases entirely stripped by the accumulation of ice. The difficulties of making repairs were increased by heavy snow following the sleet and by the preceding floods. Many cases have been reported where line conductors either had to be cut out and abandoned or chopped from under ice formed on the ground and ranging up to 8 in. in thickness.

The storm reached Michigan during the night of Feb. 22 and in the amount of destruction is reported to have been the worst in the history of the state. The storm, which lasted about twelve hours, accompanied by a 15-mile wind, covered the entire peninsula north of Bay City and Muskegon. The freezing rain formed ice on the wire 2½ in. in diameter with depending icicles 7 in. long and averaging in number five to every foot.

All telephone and telegraph service was disrupted. Stretches of telephone toll lines 50 miles long, constructed only last year, were flattened to the ground. Some poles were broken in two or three places. There was, however, no uniformity in this regard.

In some cities 40 per cent of the poles of distribution systems went down. A report from the Consumers' Power Company, which operates throughout the storm territory, states that more than 90 per cent of its service was maintained with no interruptions exceeding fifty-seven minutes.

House Hearing on Muscle Shoals Projects Coming to an End

HEARINGS before the House military affairs committee in Washington on the question of what shall be done by Congress in regard to the future of Muscle Shoals are coming to an end as this is written. By the first of the week it is expected that the committee will have all necessary data before it and be able to go into executive session to frame its report. What this report will contain there is no one in Washington with sufficient prophetic ability to forecast, not even a member of the committee. It is expected that at least a week's time, perhaps longer, will be required for the committee to make up its mind as to what sort of a report shall be brought in.

One thing seems certain as this is written. There are not enough votes to be had in the committee to provide for a majority report in favor of accepting the Ford offer. Many members of the committee are for different reasons against accepting the Ford proposition. One of the principal reasons is that that offer requires an appropriation of from $45,000,000 to $50,000,000 of new money from taxes with which to complete the project.

Campaign of N. E. L. A. for Business Development Taking Shape

DETAILS of further progress in the National Electric Light Association's program for a broad, nation-wide campaign of business stimulation and commercial development show that the movement is now taking on definite shape. A plan is being worked out which will have national direction and guidance but be applied locally in community campaigns, the inspiration and ammunition for which will be provided from the general headquarters.

The joint committee for business development, which was appointed as the result of a meeting of some fifty executives representing the several branches of the industry, has decided to function through four sub-committees, each representing a branch of the industry and responsible for the direction of the particular activity under their charge, as follows:

Lighting Committee.—P. B. Zimmerman (chairman), National Lamp Works, General Electric Company; Rex J. Cole, Duplex Lighting Works, General Electric Company; L. R. Wallis, Edison Electric Illuminating Company, Boston; S. E. Doane, National Lamp Works,

General Electric Company; F. R. Farmer, Beardslee Chandelier Manufacturing Company; E. J. Callahan, Westinghouse Lamp Company; F. W. Smith, United Electric Light & Power Company, New York; G. W. Osborne, Edison Lamp Works, Harrison.

This committee has in preparation a prospectus which will describe in detail more than twenty lighting activities for the consideration of the local organizations. It will give definite suggestions based upon the actual experiences of the many cities, such as Cleveland, Milwaukee, Los Angeles and Denver, in connection with each of the many activities suggested.

Appliance Committee.—C. E. Greenwood (chairman), Edison Electric Illuminating Company, Boston; A. K. Baylor, General Electric Company, New York; A. J. Hixon, National Association of Electrical Contractors and Dealers, Boston; W. E. Robertson, Robertson-Cataract Company, Buffalo; F. A. Ketcham, Western Electric Company, New York; A. A. Brown, Westinghouse Electric & Manufacturing Company, New York; W. R. Putnam, Idaho Power Company, Boise.

This committee will make available a brochure giving complete plans for educational demonstrations of appliances, together with suggestions for special sales campaigns and equitable methods of handling the appliance and of electrical homes.

Industrial Power Committee.—C. K. Nichols (chairman), New York Edison Company; R. S. Ballard, Southern California Edison Company, Los Angeles; A. A. Brown, Westinghouse Electric & Manufacturing Company, New York; E. W. Lloyd, Commonwealth Edison Company, Chicago; F. W. Smith, United Electric Light & Power Company, New York; W. E. Robertson, Robertson-Cataract Company, Buffalo; C. L. Collins, Reliance Electric Manufacturing Company, Cleveland.

The activities of this committee will be divided into several parts, which will include the better use of industrial power, the elimination of isolated plants, a better understanding of electric vehicle service, etc.

Wiring Committee.—A. K. Baylor (chairman), General Electric Company, New York; A. J. Hixon, National Association of Electrical Contractors and Dealers, Boston; L. R. Wallis, Edison Electric illuminating Company, Boston; LeRoy Clark, Safety Insulated Wire & Cable Company, New York; R. E. Fisher, Pacific Gas & Electric Company, San Francisco.

This committee will be equipped to give the latest suggestions on wiring information to the building industries and to the local organizations. It will be constantly working with the wiring committee of the National Electric Light Association and with all other committees on better wiring in the industry.

Following the naming of these committees and the outlining of their duties, Chairman R. H. Tillman also appointed a special committee, under the chairmanship of E. W. Lloyd, to study present central-station methods of merchandising and to outline plans for revivifying dormant or underdeveloped commercial departments.

While the direction of this broad movement will be under the direct control of those sub-committees of the joint committee for business development, the program evolved will be administered by a N.E.L.A. headquarters staff organization. This headquarters staff is to include a campaign director, who will devote all of his time to this work, and an adequate staff of complete co-operation with local organizations and with other national organizations as well as individuals in the electrical industry.

Purchase of the Los Angeles Distribution System by City Completed

THE purchase by the city of Los Angeles of the distribution system of the Southern California Edison Company within the city limits has finally been completed. This purchase has been hanging fire for several years and has been the subject of numerous legal battles. The purchase price was $11,000,000 plus additions and betterments valued at about $1,250,000. It is expected that considerable rebuilding and co-ordination of the distribution system will be effected within the next year.

Utah Manufacturers Oppose Adoption of Lighting Code at Present Time

OPPOSITION to the adoption at the present time by the Industrial Commission of Utah of a proposed industrial lighting code has developed to a considerable extent among a number of the members of the Utah Manufacturers' Association. At a recent meeting at the State Capitol, which was presided over by G. R. Yearsley, chief factory inspector for the industrial commission, and which was attended by a committee from the Utah Manufacturers' Association, it was decided that no agreement could be reached as to terms of the proposed measure. The arguments presented by the manufacturers were based largely on the claim that considerable expense would be incurred to them at a time when expense is hard to bear.

It is expected that no definite action in regard to the matter will be taken at the present time.

Radio Regulation Conference Opens in Washington

SECRETARY HOOVER opened in Washington on Monday the conference called to recommend rules to be embodied in legislation regulating the use of wireless. The open hearings, which were presided over by Mr. Hoover, conducted during the first three days of the week, while producing little in the way of constructive suggestions, did condense into one record a vast amount of information with regard to this development. This was said to be the first time that anything approaching this quantity of information has been assembled in a single volume. It was brought out very clearly that there are property rights in space and that the government is fully convinced that it is in the public interest that these rights shall be controlled. It was predicted that the time is not distant when every household will have its receiving set. One of the predictions growing out of the conference is that the day will come when the President of the United States can address every household in the land.

Committees were appointed to look into the legal and technical phases of radio-telephone communication and control, with these chairmen: Legal, Representative W. H. White; technical, Dr. S. W. Stratton, director Bureau of Standards; amateurs, Hiram P. Maxim.

In opening the conference Secretary Hoover said:

I think that it will be agreed at the outset that the use of the radio telephone for communication between single individuals as is done with the ordinary telephone is a perfectly hopeless notion. Obviously if ten million telephone subscribers are crying through the air for their mates, they will never make a junction; the ether will be filled with

frantic chaos, with no communication of any kind possible. In other words, the wireless telephone has one definite field, and that is for spread of certain predetermined material of public interest from central stations. This material must be limited to news, to education, to entertainment, and the communication of such commercial matters as are of importance to large groups of the community at the same time.

It is therefore primarily a question of broadcasting, and it becomes of primary public interest to say who is to do the broadcasting, under what circumstances and with what type of material. It is inconceivable that we should allow so great a possibility for service, for news, for entertainment, for education and for vital commercial purposes to be drowned in advertising chatter or used for commercial purposes that can be quite well served by our other means of communication.

The problem is one of most intensely technical character, but is not one without hope of fairly complete solution. Fortunately, the sending of radio-telephone messages can be arranged in wave lengths sufficiently far apart not to interfere with each other, and receivers can at their option tune their receiving instruments to the different wave bands. With the improvement in the art and in the delicacy of instruments the distance between wave lengths may eventually decrease and thus the number of layers of messages increase. Furthermore, it is possible to increase the number of sending stations and thus the variety of material, if the power applied to certain wave lengths is limited so as to circumscribe the area of distribution from a given station. Beyond this again certain times a day may be set aside within certain wave lengths for certain types of information.

Debate on Water-Power Possibilities of the St. Lawrence

IN A DEBATE between Gov. Henry J. Allen of Kansas and Gov. Nathan L. Miller of New York on the proposed St. Lawrence River ship canal, held before the seventeenth convention of the National Rivers and Harbors Congress, the water-power possibilities of the St. Lawrence River came in for discussion. The convention was in Washington, and the debate took place on Wednesday afternoon of this week.

Governor Miller objected most emphatically to any development of the St. Lawrence River at the expense of the people of New York, who would be users of the power. He also criticised most severely the report of the engineers on the project, calling it superficial. The supposition is, he said, that the electrical energy would be used in larger part in New York, but no investigation was made of the possible market or of the cost of transmission. The constitution of the State of New York forbade the erection of an electric high-tension transmission line across the Adirondack Park reservation, and in order to reach a market the transmission lines would have to go around the mountain reservations. His contention was that no money should be expended on the proposed St. Lawrence River waterway until Congress shall have made an expert and exhaustive investigation of every phase of the work. If, after such an investigation had been finished, a favorable report was made, the Governor said the State of New York would gladly support the project. He characterized the Boston-to-Washington superpower scheme as far in advance of the times and said its consummation would be a great way off. Citations were made from the report of Hugh Cooper in opposition to the proposed scheme of hydro-electric development.

The meeting was very well attended, more than 800 being present, and the debate was spirited and well received.

Supply Manufacturers to Adjourn Annual Meeting to June

APPROVAL has been given by the members of the Associated Manufacturers of Electrical Supplies to the plan of adjourning the regular annual meeting when called on March 16 to some time during the last week in June.

The annual meeting is now fixed by the constitution for the third Tuesday in March of each year, but because the summer meetings of the sections, which for the last four years have been held at New London in June, have become so popular and so largely attended, the suggestion was made that it would be better if the annual meeting could be held in the week of the summer meetings. This, it was pointed out, would avoid the expense of two important meetings coming so close together.

Under the new plan the governors whose terms of office would expire on April 1 will hold over until July 1. At the June meeting the members will consider not only an amendment of the constitution necessitated by the change of date for the annual meeting, but also necessary amendments to the bylaws, making the fiscal year of the association begin on the first day of June in each year and the terms of office of the governors begin on the first day of July in each year.

The schedule for the spring meetings of the sections follows:

MONDAY, MARCH 13

Association Rooms. — General standards committee, 2 o'clock.

TUESDAY, MARCH 14

Association Rooms.—Snap Switch Section and Molded or Formed Insulation Section, 10 a. m.; Lamp Receptacle and Socket Section and Line Material Section, 2 p. m.; Attachment Plug Section, 4 p. m.

Old Colony Club.—Signaling Apparatus Section, 10 a. m.; Industrial and Street Lighting Section, 2 p. m.

WEDNESDAY, MARCH 15

Association Rooms.—Fuse Section and Panelboard and Switchboard Section, 10 a. m.; Knife and Inclosed Switch Section and Electrical Porcelain Section, 2 p. m.; Carbon Section, 3 p. m.

Old Colony Club.—Fan Motor Section and Rigid Conduit Section, 10 a. m.; Non-Metallic Conduit Section, 2 p. m.; Armored Cable Section, 4 p. m.

THURSDAY, MARCH 16

Association Rooms.—Radio Apparatus Section and Air Circuit-Breaker Section, 10 a. m.; annual meeting, 2 p. m.

Old Colony Club.—Outlet Box Section, 9:30 a. m.; Outlet Box Fittings Section, 11:30 a. m.; Switch Box Section, 2 p. m.; Cast Box Section, 4 p. m.

FRIDAY, MARCH 17

Open for adjourned meetings.

Next Convention of Illuminating Engineers to Be at Boston

BOSTON will be the scene of the next annual convention of the Illuminating Engineering Society, which is scheduled for Sept. 25 to 28 inclusive. This will be the sixteenth annual gathering of the society, and the convention arrangements are in the hands of a committee of which C. L. Edgar, president Edison Electric Illuminating Company of Boston, is chairman; H. F. Wallace, New England manager Edison Lamp Works of the General Electric Company, is vice-chairman, and J. Daniels, illuminating engineer, Boston Edison company, is secretary.

Idaho Power Applies for License for Transmission Lines

ONLY one application was received by the Federal Power Commission during the week ended Feb. 25. The Idaho Power Company applied for a license to cover four transmission lines as follows: Thousand Springs to Caldwell, 115 miles; Boise to Malad, 90 miles; Lower Salmon Falls to Swan Falls, 85 miles; Mountain Home to Featherville, 44 miles.

Power and Irrigation Interests Clash

SHARP differences of opinion were voiced by the promoters of power and of irrigation projects as to which comes first in public importance at the first joint hearing on water rights conducted in California by federal and state officials. At the meeting, which was held Feb. 21, plans for the expenditure of more than $50,000,000 for hydro-electric and irrigation developments in Nevada and Sierra Counties were explained in detail: The Yuba Development Company is planning the expenditure of $27,000,000 in irrigation projects in those counties, and the Excelsior Water & Power Company proposes to spend $25,000,000 for power projects on the south and middle forks of the Yuba River and on Deer Creek.

Oklahoma Utilities Plan Full Program

AN UNUSUALLY full program has been arranged for the annual convention of the Oklahoma Utilities Association to be held at the Huckins Hotel, Oklahoma City, March 14 to 16. The afternoon of the first day will be given over to a joint meeting of the electric light, telephone and electric railway men to discuss the Corporation Commission's order pertaining to overhead-line construction and crossings. The application of the order will be discussed from the standpoint of the commission and each of the classes of wire-using utilities. Representatives of the manufacturers and supply men will meet to discuss the results of the national co-operative advertising program and to talk on a co-operative program for 1922. At other sessions public relations, regulation and the proposed standards of service for electric utilities order of the state commission will be discussed.

American Engineering Standards Committee Elects Officers

AT THE adjourned annual meeting of the American Engineering Standards Committee, held in New York recently, Albert W. Whitney, a representative of the National Safety Council, was elected chairman, and George C. Stone, a representative of the American Institute of Mining and Metallurgical Engineers, was re-elected vice-chairman. Mr. Whitney is associate general manager of the National Bureau of Casualty and Surety Underwriters. A. A. Stevenson, the retiring chairman, is a representative of the American Society for Testing Materials. C. E. Skinner of the American Institute of Electrical Engineers, Martin Schreiber of the American Electric Railway Association, Eugene C. Peck of the American Society of Mechanical Engineers, John A. Capp of the American Society for Testing Materials, A. H. Moore of the Electrical Manufacturers' Council, N. A. Carle of the electric light and power group and Dana Pierce of the fire protection group were among those elected to represent member bodies on the executive committee.

Illinois Utilities to Discuss Greater Energy Consumption

THE program of the electric, railway and gas associations of Illinois for the joint convention at the Hotel Sherman in Chicago on March 15 and 16 will include an investigation of the per capita consumption of central-station energy, methods of getting new business, the inductive-interference problem and the rural-lines problem.

Economics of Generation and Distribution from Operators' Viewpoint

PERFORMANCE tests of a 60,000-kw. turbo-generator, methods of securing the highest boiler-room economy, comparisons of energy-supply systems for auxiliaries, and benefits to be derived from four-wire, three-phase distribution were the subjects of a most interesting meeting held jointly in New York on Feb. 24 by the metropolitan section of the American Institute of Electrical Engineers and the American Society of Mechanical Engineers. More than 400 persons attended.

The turbine test data, which were presented by H. B. Reynolds, referred to the three-cylinder, 60,000-kw. unit of the Interborough Rapid Transit Company, New York. Operating under normal railway load fluctuations, the complete unit developed an economy of 11 lb. per kilowatt-hour. With the high-pressure element and one low-pressure unit in service, the lowest water rate was 11.25 lb. per kilowatt-hour.

Factors that have to be taken into consideration to operate a boiler room most economically and methods of applying them were discussed by I. E. Moultrop, Edison Electric Illuminating Company of Boston. With an irregular load, he pointed out, the most desirable rating at which to operate a boiler depends on amount of labor required, duration of peak, effect of forcing on maintenance, fuel consumption when forcing or banking and similar considerations.

Three methods of energy supply for station auxiliaries and their relative merits were discussed by H. C. Albrecht, Philadelphia Electric Company, namely (1) the main generating unit or main bus, (2) the house turbo-generator, and (3) a combination of the foregoing. Attention was also called to the increasing use of 2,300-volt motors where ratings of 50 hp. and more are required, the precautions necessary in protecting operators from electrical equipment, and methods of securing satisfactory speed control of alternating-current auxiliary drives.

In large plants the auxiliary service substation may be as large as or larger than any substation on the system and hence must be made just as reliable, if not more so, declared R. H. Tapscott, New York Edison Company. Francis Hodgkinson, Westinghouse Electric & Manufacturing Company, expressed the belief that selection of auxiliary drives offers the greatest opportunities for economy. Reliability is no longer an advantage peculiar to steam-operated equipment, he declared, and necessity of exhaust steam for feed-water heating is not so important with economizers. Even if feed-water must be

heated, that is no reason why uneconomical auxiliary drives should be used, he contended. Mr. Hodgkinson expressed a preference for house-turbo-generator supply to auxiliaries, citing the advantages of the method used by the Duquesne Light Company for obtaining a heat balance.

Advantages of the three-phase, four-wire distribution system were outlined by Thomas Sproule, Public Service Electric Company, who announced that the entire New Jersey system is going to be converted from two-phase, four-wire to three-phase, four-wire. Among the advantages cited were increased carrying capacity, better voltage regulation, less line loss, and ability to serve a greater area economically.

Indiana Cities Take Merger Case to Courts

A SUIT to have declared null and void the order of the Indiana Public Service Commission approving the merger of seven Indiana light and power utilities into the Indiana Electric Corporation, authorizing the issuance of securities to finance the merger and denying a rehearing of its orders in the case was filed in the Marion Superior Court on Feb. 23 by attorneys for the cities of Indianapolis and Kokomo. A permanent injunction against the carrying out of any of the provisions of the various orders of the commission in this connection is asked.

The suit throws the entire merger case, which has been fought before the commission for nearly six months, into the courts for determination.

The suit asserts that the corporation is not a public utility, that the two corporations actually proposing to buy and consolidate the seven companies are the American Public Utilities Company and the Merchants' Public Utilities Company, neither being a party to the petitions before the commission. It is asserted that the capitalization of the corporation, as provided in the order of the commission, exceeds the sum of the capitalization of the corporations to be consolidated, which is contrary to law.

Many Utilities Engaged in Financing in February

STOCKS and bonds totaling $30,635,900 were offered investors by the electric light and power public utilities during the month of February. This figure, the smallest total recorded since October of last year, represents a decrease of more than $20,000,000 under that of January. February, 1921, also showed a decided drop from the total of the preceding month. The number of separate issues, however, was large. The average yield, 6.90, is slightly higher than that for January. The most prominent characteristic of the month's flotation is the decline in the interest rate. Four of the issues, for instance, paid only 5 per cent interest. Another interesting feature was the ten-point premium on the $1,800,000 8-per cent preferred-stock issue of the Consolidated Gas, Electric Light & Power Company of Baltimore. Long-term issues again predominate. The $5,760,000 issue of the Pennsylvania Power & Light Company constitutes the largest single offering.

Name of Company	Amount of Issue	Period	Class of Security	Purpose of Issue	Rate of Interest	Per Cent Yield	Offered At
Philadelphia Electric Co.	$4,000,000	.....	Cumulative preferred stock..	.....	8	....	Par (25)
California-Oregon Power Co.	1,000,000	Twenty-year	First and refunding mortgage sinking-fund gold bonds, series B	Extensions	6	6.60	93¾
Central Illinois Light Co.	2,750,000	Twenty-one year	First and refunding mortgage gold bonds	To retire bonds falling due and to reimburse company for expenditures made in improvements to property.	6	6.50	94¼
Central Massachusetts Light & Power Co.	300,000	Five-year	Convertible bonds, series C...	To purchase notes issued and to be issued of the companies whose shares are owned	6	7.20	95
Consolidated Gas, Electric Light & Power Co. of Baltimore	1,800,000	.....	Cumulative preferred stock, series A	.....	8	7.27	110
Defiance Gas & Electric Co.	525,900	Twenty-year	First lien and refunding mortgage sinking-fund gold bonds, series A	.....	7	7.25	97½
Ozark Power & Water Co. (Branson, Mo.)	2,000,000	Thirty-year	First mortgage sinking-fund gold bonds	.....	5	7.20	73
Pennsylvania Power & Light Co.	5,760,000	.....	Cumulative preferred stock..	To reduce floating debt and for other corporate purposes	$7.00	7.29	(no par)
				.....	5	6.05	86
Sierra & San Francisco Power Co.	1,000,000	Twenty-seven year	First mortgage bonds				
Southern Cities Utilities Co.	200,000	Ten-year	Gold coupon notes	To purchase additional property and equipment	8	8	100
Tri-City Railway & Light Co. (Davenport, Ia.)	$1,000,000	Eight-year	First and refunding mortgage gold bonds of 1910	To retire underlying bonds and reimburse company for construction expenditures	5	6.25	92
American Public Service Co.	1,000,000	Twenty-year	First lien gold bonds of 1912	Partially to reimburse company for expenditures made for improvements, betterments and extensions to property	6	7	89
Denver Gas & Electric Light Co.	3,000,000	Twenty-nine year	First and refunding mortgage sinking fund gold bonds of 1911	Refunding and other corporate purposes	5	6.10	85¼
Eastern Shore Gas & Electric Co.	1,450,000	Thirty-three year	Consolidated mortgage sinking-fund gold bonds, series A	Refunding, retiring debentures falling due and other corporate purposes	7	7.25	97
Ohio Public Service Co.	4,000,000	Twenty-five-year	First mortgage and refunding gold bonds, series B	Refunding and other corporate purposes	7	7	Par
Virginia-Western Power Co.	850,000	Twenty-year	First and refunding mortgage gold bonds, series A	To retire notes and for extensions	7	7.25	97½
Total	$30,635,900						

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Indiana Company Promises Reduced Rates if Allowed to Buy Its Energy.—The Interstate Public Service Company, which owns and operates an electric plant and a distribution system in Lebanon, Ind., has applied to the Public Service Commission for permission to discontinue this plant and to buy energy from the Terre Haute & Eastern Traction Company, which has a line running through Lebanon. The present primary rate of 12 cents a kilowatt-hour to Lebanon customers will be reduced to 10 cents, the company says, if the commission approves the agreement.

N. F. P. A. Men Ready for Suggestions.—In anticipation of next fall's meeting of the electrical committee of the National Fire Protection Association, comments or suggestions from interested individuals, firms or organizations concerning proposed changes in the so-called 660-watt rule, which limits the current load on the ultimate branch circuit, will be welcomed by either A. Penn Denton, chairman sub-committee on wiring systems and standards, Seventeenth and Oak Streets, Kansas City, Mo., or A. R. Small, chairman subcommittee on devices and materials, 207 East Ohio Street, Chicago.

Oklahoma Utility Improves Plant.—Improvements and additions to the Oklahoma City power plant of the Oklahoma Gas & Electric Company have increased the plant capacity 25 per cent. One new 850-hp. boiler with a superheater and auxiliaries has been installed, giving the plant a battery of ten boilers, which use in excess of 200,000 gal. of water per day. Superheaters have also been added to three boilers formerly in service. A new stack, 156 ft. high and 6 ft. 3 in. in diameter, is now complete. Twenty-seven circuits for the lighting of Oklahoma City now radiate from the Noble Street plant.

Beavers Cause Interruption to Service in Hood River District.—A colony of beavers on the east fork of the Hood River, recently felled a tree 18 in. in diameter that came down across a power line of the Pacific Power & Light Company and plunged the upper Hood River valley in darkness for hours. Repair crews have no little trouble repairing damage wrought by these persistent animals in this part of Oregon. A year ago they felled a tree in the same way, interrupting light and power service, and last summer one of their dams constructed below a county bridge across the east fork of Hood River backed water over approaches to the structure and had to be removed.

Pennsylvania Power & Light Company Takes Over Wilkes-Barre Company.—With the approval of the Pennsylvania Public Service Commission, all the property of the Wilkes-Barre Company has been leased by the Pennsylvania Power & Light Company and will be operated by the latter. It is understood that there will be no present change in the local management. A new transmission line from the Pennsylvania company's Hauto plant to Wilkes-Barre is being built and will be ready about June 1.

Growth of Electrical Engineering.—The rapid growth of electrical engineering in the United States is indicated by a few fragmentary items from the 1920 census which have been given out by the bureau. These show that Texas had 4,359 electrical engineers and electricians at the time the census was taken, as compared with 2,232 in 1910. Buffalo in 1920 had 2,420 electrical engineers and electricians. This compares with 1,347 in 1910. Oakland, Cal., had 1,257, an increase from 784. Pittsburgh had 2,186, comparing with 1,543 in 1910. Omaha had 719, as against 443. Providence had 590, which compares with 440. Delaware had 701. In 1910 the state had only 318.

Co-operative Agreement in Southern California.—In order to avoid further duplication of facilities the Pacific Gas & Electric Company and the Western States Gas & Electric Company have, subject to the approval of the commission, entered into an agreement for a division of territory in San Joaquin County, and each company has agreed to sell its transmission and distribution lines in the territory assigned to the other. The Western States Gas & Electric Company serves the city of Stockton, while both companies have been operating in the county outside of the city. The proposed division of territory is in the neighborhood of Lodi and Lathrop. The reproduction value of the properties for the Pacific company involved in the transaction is given as $170,504 and that of the Western company at $64,492.

Electrically Driven Ferryboats Are Planned for New York City.—Three new ferryboats are soon to be built by the municipal authorities of New York for use on the city's line to Staten Island. The boats will be coal burners with electric drive. In order to secure greater economy in operation than is possible with reciprocating engines, it has been decided to install a steam-turbine-driven generator supplying high-tension alternating current to a motor at each end of the boat, the latter being directly connected to the propeller shaft. It will thus be feasible, the city's Commissioner of Plant and Structures explains, to run the two propellers at different speeds, which, it is expected, will result in increased propulsive efficiency as compared with the present method of attaching both propellers to one through shaft and revolving them at the same speed.

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month.

North Central Electric Association.—The annual convention of this geographic division of the N.E.L.A. has been set for June 13-15 at the St. Paul Hotel, St. Paul, Minn.

Southwestern Electrical and Gas Association. — The eighteenth annual meeting of this association will be held in San Antonio, Tex., on May 3-6, in connection with the meeting of the Southwestern Geographic Division of the N.E.L.A. Texas, Oklahoma, Arkansas and Mississippi will be represented.

Section Meetings of A. I. and S. E. E.—March meetings of the Association of Iron and Steel Electrical Engineers are scheduled as follows: Philadelphia, March 4, "Automatic and Remote-Controlled Substations," by R. Tencher, district manager Dwight P. Robinson & Company, Chicago; Cleveland, March 13, "Protective Relays for Generators and Transmission Lines," by L. N. Crichton, engineer supply engineering department, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.; Chicago, March 15, "Description of Plant of Acme Steel Goods Company," by J. H. Wagner, and "Description of New Merchant Mill of Interstate Iron & Steel Company," by H. E. Davis; Pittsburgh, March 18, "Synchronous Motors in Mines and Steel Mills"; Birmingham, March 25, "Lubrication of Mill Motors," by H. E. Harrell, assistant chief electrician Tennessee Coal, Iron & Railroad Company; Youngstown, March 25, "Bent-Tube Versus Straight-Tube Boilers."

Coming Meetings of Electrical and Other Technical Societies

A. I. and S. E. E. Section Meetings—Philadelphia, March 4; Cleveland, March 13; Chicago, March 15; Pittsburgh, March 18; Youngstown, March 25; Birmingham, March 25.

A. I. E. E. Section Meetings—New York, March 15; Pittsburgh, March 15; Schenectady, March 17.

American Physical Society—Washington, April 22.

Associated Manufacturers of Electrical Supplies—New York, March 13-17.

Oklahoma Utilities Association—Oklahoma City, March 14-16.

Illinois State Electric Association—Chicago, March 15-16.

Wisconsin Electrical Association—Milwaukee, March 22-24. (For program see issue of Jan. 14, page 96.)

A. S. M. E. Spring Meeting—Atlanta, April 8-11.

American Electrochemical Society—Baltimore, April 27-29.

N. E. L. A. Annual Convention—Atlantic City, May 15-19.

N. E. L. A. Geographic Divisions—Southwestern, San Antonio, May 3-6; Pacific Coast, Los Angeles, May 31-June 3; Northwestern, Boise, June 7-10; North Central, St. Paul, June 13-15.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies

Findings of Fact Made by Commission Not Conclusive Under Indiana Law.—The Supreme Court of Indiana, in Public Service Commission vs. Lake Erie & Western Railroad Company, has declared that, under the statutes of Indiana, findings of fact made by the commission are not conclusive in a superior court when an action is brought to set aside a commission order, since in that case the court tries the case de novo. (133 N. E. 492.)*

Assumption of Risk.—An experienced miner who had worked six months in a drift containing an unprotected electric trolley wire 5 ft. above the floor level and who knew of the existence and danger of the wire was held by the United States Circuit Court of Appeals in Utah (Bianco vs. Bingham Mines Company) to have assumed the risk, and a verdict awarding damages to the widow of a man killed under the circumstances indicated was reversed. (276 Fed. 513.)

Commission's Rates Are Prima Facie Lawful.—Sustaining the Public Service Commission of Montana in a suit brought against it by the Billings Utility Company, the Supreme Court of Montana declared that rates fixed by the commission in accordance with the law are prima facie lawful, can be attacked in court on the sole ground that they are unlawful or unreasonable, shall be deemed reasonable and just until final determination by the courts, and the burden of proof rests on the party antagonizing the order fixing the rates. (203 Pac. 366.)

Contributory Negligence for the Jury—The Supreme Court of North Carolina has held, in Snyder vs. Town of Ashboro, that there was no error in refusing to permit a witness to express his view of the necessity of the action of a head operative in a rolling mill who placed his hands underneath and upon rolls operated by electricity to discover why they were not working properly. The electrical energy to run this mill was furnished by the municipal plant, and the plaintiff recovered damages from the town on the ground that, after a suspension of service, the connections had been wrongly made by the town's workmen and that the machine therefore operated backward instead of forward and caused his injury. The question of contributory negligence was, the Supreme Court held, rightly left to the jury. (110 S. E. 84.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

What Constitutes a Public Utility?—Holding, in Celina vs. Union-Center Mutual Telephone Association, that a group of persons denominating themselves a partnership association but organized to conduct a local telephone exchange were carrying on a public utility, the Supreme Court of Ohio found that there was neither denial of property rights nor abridgment of privileges and immunities nor denial of the equal protection of the law in requiring such an association to obtain a certificate of convenience as a prerequisite to doing business. (133 N. E. 540.)

Electricity Personal Property.—Asserting that electricity is a product of manufacture and therefore personal property, the Supreme Court of Colorado, in Hetherington vs. Camp Bird Mining, Leasing & Power Company, sustained the lower court in finding that the plaintiff could not recover the price paid by the defendant for electricity generated on the plaintiff's property and sold to the defendant by the original owner of the property while said original owner was temporarily repossessed in the course of an unsuccessful attempt, supported by the defendant, to redeem the property, which had been sold to the plaintiff, as trustee, under foreclosure proceedings. (202 Pac. 1087.)

Commission May Compel Utility to Make Extensions.—Petitioned by the Bluefields Waterworks & Improvement Company to suspend a rate-making decision of the West Virginia Public Service Commission, the Supreme Court of Appeals of that state declared that the commission could lawfully require a public utility to make extensions and additions to its plant when they are necessary to enable it to serve the public as required by law or the provisions of its contract or franchise, and, further, that a public utility has no right to a rate sufficient to cover the cost of expenditures for extensions or additions to its plant in advance of the actual installation of such extensions or additions and their employment in the public service. (110 S. E. 205.)

Federal Income Tax Must Not Be Included in Operating Expenses.—The Georgia Railway & Power Company brought suit in the United States District Court at New Orleans against the Georgia Railroad Commission because of a reduction in gas rates ordered by the commission, and among the company's contentions was one for the right to include federal income taxes as part of operating expenses. The court not only ruled against the company, but censured it for bringing an action based in part on the claim that the income tax could properly be passed on to the consumer. In this case the Georgia Railroad Commission ordered a reduction in the gas rates charged by the company on the ground that readjustment conditions following the war were no longer prevailing. The company sought to retrieve an alleged loss of $1,000,000 sustained from 1917 to 1920.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities

Commission's Duty to Utilities.—In giving a rehearing to the Sault Ste. Marie Gas & Electric Company in the matter of its gas rates the Michigan Public Utilities Commission observed: "So far as the commission is concerned, it has a plain duty, under the law, to perform, of allowing rates which will produce sufficient revenue to pay all legitimate operating expenses, create a reserve to take care of depreciation, and allow a fair return upon a fair value of the property. . . . It is just as much the duty of this commission to see that a utility gets sufficient revenue to properly function and give service as it is to see that the utility does not get too high a rate of return."

Company-Wide Electric Rates.—The Commerce Commission of Illinois recently arrived at a decision on the reasonableness of an electric rate proposed for the village of Winslow by comparing it with the rates charged for the same class of service by the same company in other communities. "So far as possible," the commission asserted, "the rates of an electric utility furnishing service in a number of municipalities by transmission lines should be uniform throughout the territory served. Inasmuch as the village of Winslow is receiving service as a part of a relatively large electric system, a separate investigation of the results of service in Winslow, a comparatively small community, would serve no purpose."

Heating and Cooking Rates.—Dealing with an application from the village of Eagle River for an increase in the rates for energy for grills and radiators, the Wisconsin Railroad Commission said recently: "Flat rates in general are unsatisfactory and wasteful but are especially ill adapted to appliances of high wattages, such as electric grills and radiators, where the use will vary to a great extent among different consumers. The rates proposed by the applicant will result in an unusually high rate if the average use of the appliances is less than two hours per day and in an unusually low rate if they are used much over four hours a day. As the average use will probably be over three hours a day, we cannot hold that the proposed rate will be excessive for the average consumer. We shall therefore authorize the proposed rate, but would strongly recommend that the applicant file a schedule of meter rates and proceed to install meters for all customers where it is difficult to determine the amount of electrical energy that is being consumed."

Men of the Industry

Changes in Personnel—Responsibilities and Association Appointments of Men Engaged in Professional, Executive, Operating and Commercial Branches of the Industry

Edward B. Meyer, formerly assistant chief engineer of the engineering department of the Public Service Electric Company, has been appointed chief engineer of the Public Service Production

E. B. MEYER

Company to engage in general engineering and construction work. Mr. Meyer is most widely known for the excellent contributions which he has made to the literature on transmission and distribution engineering as chairman of the A. I. E. E. transmission and distribution committee and of the N. E. L. A. underground systems committee. He is author of "Underground Transmission and Distribution," a book dealing with every phase of underground construction. In addition to his work in the field of transmission and distribution, Mr. Meyer has had extensive experience in every branch of central-station construction since he first became connected with the industry in 1903. He was responsible for the construction and in complete charge of the field forces during the erection of the Essex power station of the Public Service Electric Company, a job which set a speed record in power-plant building.

During the war Mr. Meyer was a member of the committee formed to advise the government on the standardization of electrical equipment and supplies, particularly cable. He is at present vice-chairman of the American Engineering Standards sectional committee on insulated wires and cables and is a member of several of the sub-committees. Mr. Meyer was born in Newark, N. J., in 1882 and was graduated from Pratt Institute, Brooklyn, in 1903. Immediately upon graduation he entered the employ of the Public Service Electric Company and continued with that company until 1922. In 1906 he was made field engineer in charge of the installation of underground transmission and distribution systems, continuing in that capacity until 1909, when he was made assistant engineer in charge of the entire street department. In 1912 he was appointed assistant to the chief engineer in general charge of all construction work involving the installation of power plant, substation and outside plant facilities. Mr. Meyer retained that position until 1919, when he was appointed assistant chief engineer, a position which he occupied until Feb. 1, 1922, on which date he became chief engineer of the Public Service Production Company.

E. C. Headrick has been appointed chairman of the Denver Electrical Co-operative League, from which position T. O. Kennedy recently resigned. Mr. Headrick started his career in the electrical industry under the direct supervision of George Westinghouse. He was born at Johnstown, Pa., Feb. 22, 1869, and after being graduated from high school in that city went to Pittsburgh, where he entered the private laboratory carried on by Mr. Westinghouse for the conduct of his personal experiments. In 1900 Mr. Headrick was sent to France as a special representative of the Westinghouse company and after two years abroad returned to this country to ac-

E. C. HEADRICK

cept a position as assistant shops superintendent in the power apparatus department of the Western Electric Company in Chicago. Later he returned to France to redesign the engines made by the Rateau Turbine Company in order to standardize production in this country. In 1909 he went to Denver and started a contractor-dealer business of his own, specializing in the handling of motors and heavy machine equipment. Mr. Headrick served as president of the Denver Association of Electrical Contractors and Dealers during the years 1919, 1920 and 1921. In that capacity he used every effort to bring about co-operation within the industry. He became vice-chairman of the Electrical Co-operative League when it was organized in June, 1921.

Charles W. Spooner, a Grand Rapids consulting engineer, has organized with

C. W. SPOONER

Robert H. Merrill the firm of Spooner & Merrill, consulting engineers. After graduation from the University of Michigan's course in civil engineering Mr. Spooner's preliminary practical training was obtained in surveying, drafting and computing work throughout the Western States. In 1906 he became associated with Gardner S. Williams at Ann Arbor, Mich., in the design of water-power developments and hydro-electric power plants and in general hydraulic investigations. As a result of this work Mr. Spooner became associated at Ann Arbor with a new branch of engineering, the appraisal and valuation of public utilities, begun by Dean M. E. Cooley and Professors Riggs and Anderson. From 1911 to 1916 he assisted in the valuation of the Edison Sault Electric Company of Duluth, the Grand Rapids Railway Company, the Toledo & Indiana Railway Company and many other companies. In 1916 Mr. Spooner began independent practice, and his valuation work has included the La Crosse Gas & Electric Company, the Arkansas Valley Railway, Light & Power Company, the 1919 rate cases for the Wisconsin - Minnesota Light & Power Company and the rate cases of 1920 affecting the Eastern Wisconsin Electric Company gas and electric properties.

J. C. Thompson, formerly division manager of the California - Oregon Power Company at Klamath Falls, Ore., has been made assistant treasurer.

Judds J. Brooks, Jr., formerly general manager of sales, Harbison-Walker Refractories Company, Pittsburgh, has been appointed assistant to the president.

H. A. Kimber, formerly of the Quigley Furnace Specialties Company, is now in charge of the Quigley pulverized-fuel department of the Hardinge Company, 120 Broadway, New York, the latter organization having absorbed the Quigley company's pulverized-fuel department recently.

Frank Venable, assistant manager of the Montana Electric Company, Butte, has been appointed to a special committee of the Associated Industries of Montana, which has been charged with the work of extending the scope of the association until it fulfills the duties of a state-wide chamber of commerce.

Leonard Kebler, president of the Ward Leonard Electric Company, Mount Vernon, N. Y., sailed from New York Feb. 18 for a three months' combined business and pleasure trip through the Riviera, Egypt, Italy, France, Switzerland and England. He will be accompanied by Mrs. Kebler.

C. E. Ingalls has resigned as San Francisco district manager for the Crocker-Wheeler Company and will shortly enter the field as a manufacturer's representative with offices in the Rialto Building, San Francisco. Arthur Purdon has been appointed to the district managership to fill the vacancy caused by Mr. Ingalls' resignation.

Burton Y. Gibson, a pioneer in the electric cooking and heating industry on the Pacific Coast, has been appointed factory representative on that coast and in the Hawaiian Islands for the Walker & Pratt Manufacturing Company, Boston. Mr. Gibson has spent the past fifteen years in the electrical

B. Y. GIBSON

business, during ten of which he has specialized on electrical heating and cooking problems. He was with the Edison Electric Appliance Company for six years. He will have his headquarters in San Francisco.

F. O. Hoyt, formerly on the staff of the New York sales department of the Standard Underground Cable Company, has been appointed manager of the Philadelphia sales department, having charge of the eastern Pennsylvania, southern New Jersey and Delaware territories.

A. E. Hitchner, assistant to the manager of the industrial department of the Westinghouse Electric & Manufacturing Company, until further notice will have general charge of those sections of the company organization formerly handled by W. H. Patterson, who recently resigned as assistant to the manager of the industrial department to accept the position of vice-president of the Kaestner & Hecht Company, Chicago.

A. E. HITCHNER

G. I. Kinney, San Francisco manager for the International General Electric Company, has been elected to the directorship of the Foreign Trade Club of San Francisco, as the result of his activities in the promulgation of foreign trade out of San Francisco.

Edward H. Eardley, who was recently elected president of the Contractor-Dealers' Association of Salt Lake City, is one of the pioneers in the electrical industry in that city, his first connection with the business world having been as an office boy with the Holding Electric Company. He established a contractor-dealer business of his own in 1906, and this has grown until at the present time the Eardley Electric Company is one of the most active and progressive firms of its kind in Salt Lake City. He has been actively connected with the Contractor-Dealers' Association for the past twelve years and has served as secretary of that organization for five years. He was one of the first to lend his influence to the co-operative idea in that territory and was one of the founders of the Rocky Mountain Electrical Co-operative League. He has recently been elected to the executive committee of the National Association of Contractor-Dealers.

W. M. Vernor, formerly with the Westinghouse Electric & Manufacturing Company at New York, has resigned to take up work as an electrical engineer and salesman with the Catton-Neill Engineering & Machinery Company, Manila, P. I.

Obituary

Albert G. Whitney, president of the St. Cloud (Minn.) Public Service Company, died on Feb. 2. Mr. Whitney was one of the pioneers in the building of high-voltage lines in Minnesota. He came to St. Cloud in 1887 and took over the central station of that city and by hard work built it up to a large company serving about fifty cities.

Sir Francis Barker, a director of Vickers, Ltd., London, Eng., died the first week in February at his home in London, at the age of fifty-six. Sir Francis was an important factor in the organization of the foreign development of the Parsons turbine and was instrumental in establishing works for this business in the principal countries of Europe. He was chairman of the executive council of the Russo-British Chamber of Commerce.

William J. Canning, assistant secretary of the Edison Electric Appliance Company, Chicago, Ill., died at his home in Brooklyn, N. Y., on Feb. 13. Mr. Canning had been with the General Electric Company and the Edison Electric Appliance Company for many years, having started in as an office boy with the former company in 1888. Later he entered sales work and in 1895 was transferred to the Philadelphia office in that capacity. Three years later he was appointed to a

W. J. CANNING

position of special service to the sales executives of the company. From 1904 to 1912 he served as a district heating salesman in the New York territory. Since 1913 he had been engaged as assistant to A. K. Baylor.

Trade and Market Conditions

Business Reviews, Together with Market Letters from Important Trade Centers, on the Supply, Demand and Prevailing Prices of Electrical Apparatus and Supplies

Strenuous Efforts to Liquidate Old Accounts

A CAMPAIGN has been opened by various industries, it has been learned, among them particularly those selling to the smaller retailer, to clean up past-due accounts. To some extent this policy is being applied to the electrical industry, though so far it has not been as noticeable as in several others. The plan being followed is to send out collection men, whose road expenses are paid and who receive 5 per cent of all collections. Oftentimes, according to an authority on collections, this method brings good results in the case of the small dealer, who pays little attention to a letter, but will settle up a bill if approached personally.

February saw a considerable increase in the number of accounts posted with an electrical credit organization, while on the other hand settlements decreased fully as much. Many of the accounts posted were for small sums, but in the aggregate totaled enough to present a serious problem to the smaller manufacturers and jobbers. It was pointed out that in these days of keen price competition both classes are doing business on a small margin of profit, and losses through bad accounts cannot be charged off as easily as they could formerly.

During the past four or five months credit managers of electrical houses have been more chary than ever before in extending credits, and for that reason losses on recent accounts have been kept down to a fairly satisfactory minimum. Still, it is difficult to refuse to sell to a contractor who has a contract to fill, though in many cases the contractor is kept waiting for his money and so the jobber in turn must wait. These latter accounts are not classed as bad, but the method creates a situation of strained credit throughout the whole industry.

Detailed Figures for Electrical Exports During 1921

EXPORTS of electrical goods from the United States during 1921 are shown in detail in the table presented on the opposite page. The table was compiled by the ELECTRICAL WORLD from data obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C. The total amount of electrical goods purchased from American manufacturers by each country purchasing more than $50,000 worth is shown, with a further subdivision into kinds of product. The table also gives the total amount of each item sold to all countries. Forty countries are grouped under the heading "all others," having taken individually less than $50,000 worth.

Two items, arc lamps and electric locomotives, have been omitted from the table on account of the comparatively small number of individual sales. The most important purchasers of arc lamps were Canada, which bought $7,922 worth; Mexico, $2,329; Bolivia, $1,402, and Japan, $1,228. Sales of electric locomotives included the following large ones: Brazil, $1,664,181; British India, $151,418; Japan, $69,960; Chile, $55,376; British South Africa, $49,202; Panama, $46,708; England, $25,334; Canada, $22,219. These figures have been included in the totals.

Canada proved the best customer of the United States, taking a total of $11,812,901 worth of all kinds of apparatus and appliances. As a whole, England and the British possessions took approximately 30 per cent of all electrical goods exported during 1921. The amounts were: England, $4,258,216; Scotland, $182,085; Ireland, $30,450; Newfoundland, $257,887; Jamaica, $238,920; other British West Indies, $192,088; British Guiana, $70,888; British India, $3,394,616; Australia, $7,433,441; New Zealand, $1,928,339; British South Africa, $2,349,047. The South American countries proved good buyers also, the largest being Brazil, with a total of $6,739,622, while Argentina imported $3,903,905 worth. Cuba took $5,751,846 worth. Japan, with a total of $9,631,086, was topped only by Canada. The total for China was $4,085,566, and Mexico bought $5,776,972 worth.

Electrical Manufacturers' 1919 Taxes Amount to $19,306,429

COMPANIES engaged in the manufacture of general electric machinery, stationary and marine engines and refrigerating machinery paid taxes totaling $19,306,429 in 1919, according to a compilation just completed by the Bureau of Internal Revenue. The number of companies making returns was 343. Of these 333 companies had net incomes aggregating $66,930,812. Ten of the companies reported no net incomes. Their deficits totaled $316,514.

In connection with the taxes on electrical goods, Treasury Department Regulations 47, recently revised and relating to excise taxes on sales by manufacturers, has just been issued. Article 34 of the regulations defines what is meant by portable lighting fixtures. All lighting devices adapted for interior illumination and not designed to be fixed permanently in one location and all articles commonly known as such, irrespective of the principle of illumination used, are included in this classification.

Metal Market Situation

AT LEAST one large selling agency was reported earlier this week as offering copper at 12¾ cents per pound for March and April deliveries, but some consumers have stated that they are unable to secure any of the metal under 12¾ cents. Nominal quotations at the time were maintained at 13 cents, with no orders and very few inquiries reported. Exports for the month have been slightly over 40,000,000 lb. A sale of 2,000 tons to a French consumer at the beginning of the week was reported, but confirmation could not be obtained. In spite of the continued lack of buying an improved undertone is apparent. There is less copper in possession of second-hands, and standard copper at London has been more active the past few days.

Current output of Lake copper is averaging about 8,500,000 lb. a month, and upon the resumption of the Calumet & Hecla properties this will run about 11,500,000 lb.

NEW YORK METAL MARKET PRICES

	Feb. 21, 1922	Feb. 28, 1922
Copper:	£ s. d.	£ s. d.
London, standard spot	58 0 0	58 15 0
	Cents per Pound	Cents per Pound
Prime Lake	13.00	13.00
Electrolytic	12.75	12.75
Casting	12.50	12.50
Wire, base	14.25–14.50	14.00–14.25
Lead, Am. S. & R. price	4.70	4.70
Antimony	4.35	4.25
Nickel, ingot	41.00	41.00
Sheet zinc, f.o.b. s melter	8.00	8.00
Zinc, spot	4.87½	4.90
Tin, straits	29.25	30.00
Aluminum, 98 to 99 per cent	19.10	19.10
OLD METALS		
Heavy copper and wire	10.00–11.00	10.50–11.25
Brass, heavy	4.75– 5.00	4.75– 5.00
Brass, light	4.25– 4.50	4.25– 4.50
Lead, heavy	3.50– 3.75	3.50– 3.75
Zinc, old scrap	2.00– 2.12½	2.25– 2.50

Exports of Electrical Goods from the United States During 1921 by Countries and Items

	Batteries	Carbons	Dynamos and Generators	Fans	Heating and Cooking Apparatus	Insulated Wire and Cables	Interior Wiring and Supplies	Lamps		Magnetos and Spark Plugs	Meters and Measuring Instruments	Motors	Rheostats and Controllers	Switches	Telegraph Apparatus	Telephones	Transformers	All Others	Total per Country
								Carbon-Filament	Metal-Filament										
Belgium	24,921	272	103,627	572	1,695	41,482	7,551	531	58,589	6,515	45,977	444,271	46,634	427,791	108	179,435	53,583	684,945	2,128,51
Denmark	45,199	.....	11,053	80	210	23,036	1,220	.....	2,219	17,293	9,750	9,899	76	1,864	1,351	7,548	812	42,527	174,137
Finland	8,274	.....	13,984	.....	.....	2,630	490	.....	1,033	2,548	1,384	13,572	.....	218	.....	1,465	.....	25,688	71,286
France	26,042	390	215,096	240	4,507	134,416	12,124	2,562	41,459	61,288	13,608	525,361	3,165	69,407	9,723	95,118	642,888	1,159,579	3,016,973
Germany	.....	3,000	634	27	1,737	1,326	139	.....	741	225	632	7,683	.....	53	.....	85	4,445	28,607	49,514
Greece	1,887	.....	13,919	30	1,930	4,336	4,892	.....	3,605	414	638	2,251	2,305	14,412	.....	138	300	43,099	94,166
Italy	243	138	133,772	374	3,721	107,670	2,898	.....	4,772	2,108	16,239	83,885	20,325	68,180	.....	15,682	346,836	887,566	1,691,688
Holland	47,490	.....	12,030	177	13,817	154,969	5,360	.....	600	13,431	25,652	52,015	3,583	39,722	19,401	159,773	2,071	190,890	740,981
Norway	20,935	122	17,236	1,492	15,899	27,913	2,978	15	3,927	5,632	5,540	13,377	972	5,095	95	78,732	151,529	323,911	692,399
Poland	.....	.....	76,500	.....	.....	267,603	.....	.....	13,750	2,020	.....	5,411	.....	.....	.....	.....	.....	12,384	377,488
Portugal	7,159	.....	350	.....	42	9,574	1,765	.....	2,801	736	50	904	.....	6,106	.....	8,556	16,564	41,005	95,612
Rumania	117	.....	450	.....	419	984	2,598	.....	3,630	489	2,215	44,736	1,765	2,176	.....	2,755	1,229	9,233	72,666
Spain	76,180	782	337,257	48,182	28,771	75,463	7,004	1,068	49,210	31,972	70,440	391,115	59,240	75,731	4,149	45,662	449,561	1,034,190	2,793,177
Sweden	8,389	4,216	1,113	.....	1,369	2,342,710	1,361	.....	5,976	9,156	6,670	40,763	440	817	440,687	248,610	38,214	512,563	3,663,054
Switzerland	2,848	.....	1,726	676	4,731	37,956	5,881	.....	.....	658	1,091	33,989	26	33,689	.....	113,495	189	200,898	436,853
England	283,628	57,490	113,897	24,499	149,377	233,598	76,376	32,734	27,802	68,001	242,606	600,594	17,851	267,850	62,587	356,287	64,284	1,853,431	4,258,216
Scotland	1,185	511	5,503	303	22,437	40,412	2,391	.....	29	1,786	9,512	54,728	3,217	39	5,580	1,584	.....	32,868	182,085
Bermuda	2,939	.....	.....	713	1,798	6,125	10,207	159	4,021	507	4,100	8,739	.....	1,342	916	4,080	5,471	21,884	70,001
Canada	1,202,558	234,008	671,671	121,639	254,746	196,795	348,377	10,880	171,124	366,619	310,430	1,443,197	100,325	629,958	71,209	639,627	265,205	4,744,392	11,812,901
Costa Rica	4,539	1,711	4,108	88	7,435	17,045	5,848	330	6,975	6,975	234	17,178	456	3,254	1,621	6,606	7,196	39,832	135,324
Guatemala	10,444	9,635	9,342	201	4,603	16,053	16,895	693	44,518	951	1,859	15,504	236	5,951	484	5,638	20,183	33,560	192,750
Honduras	15,945	162	13,078	1,314	2,088	17,624	10,939	42	13,884	3,482	4,430	14,331	316	5,671	45	7,804	16,664	54,723	182,542
Nicaragua	6,293	216	5,730	270	247	6,638	8,023	194	6,794	905	775	4,343	770	3,405	1,532	2,668	6,296	32,248	87,555
Panama	40,692	1,446	8,993	11,576	28,305	78,541	24,418	8,976	176,435	11,812	10,588	108,706	3,926	14,594	15,368	12,874	42,177	201,236	847,371
Salvador	5,198	119	14,741	614	2,917	11,797	5,298	1,006	22,092	987	903	15,763	437	2,306	87	2,392	10,188	19,690	116,535
Mexico	324,799	20,491	481,242	69,466	195,371	655,084	230,349	18,884	456,543	59,658	195,468	872,242	18,575	204,209	29,792	126,575	496,613	1,407,002	5,776,972
Newfoundland	34,014	432	12,101	142	5,084	23,629	6,477	55	22,086	4,258	9,902	20,821	4,892	12,693	12,115	27,661	21,929	39,596	257,887
Jamaica	20,326	.....	20,297	4,452	1,475	22,006	5,703	2,023	12,445	3,034	11,870	21,336	3,469	5,718	2,118	14,488	6,736	80,727	238,920
Trinidad	11,773	674	15,207	2,046	2,537	29,680	11,004	544	11,097	3,500	5,498	10,149	2,804	9,395	288	6,733	3,507	46,057	162,493
Other British W. I.	7,940	.....	55,411	123	82	29,441	5,031	70	2,080	709	1,232	4,612	679	3,412	5,759	4,010	14,981	56,516	192,088
Cuba	159,680	9,552	776,472	150,112	64,788	780,846	305,125	3,114	290,423	60,959	183,880	537,779	74,867	248,192	21,203	341,613	237,304	1,545,687	5,751,846
Haiti	3,987	105	16,961	2,350	316	1,768	964	.....	903	674	208	3,623	57	535	.....	1,087	560	17,943	52,041
Dominican Rep	12,349	8	69,324	469	1,265	61,850	17,459	255	9,609	4,515	13,002	32,596	2,735	11,328	13,553	9,960	10,718	118,494	389,489
Argentina	294,176	8,028	163,156	89,552	181,401	278,157	116,314	3,001	392,497	145,959	73,983	902,520	30,834	112,051	12,891	130,842	63,110	902,717	3,903,905
Bolivia	4,738	35	42,979	.....	525	52,815	2,493	.....	6,753	96	1,562	50,747	698	1,275	8,314	5,285	50,025	49,689	279,331
Brazil	65,861	8,055	413,435	23,492	103,694	669,742	110,044	10,984	301,860	34,296	106,403	582,697	76,548	142,261	10,036	301,230	628,185	1,485,648	6,739,622
Chile	98,217	67,399	88,266	3,898	10,353	243,114	41,653	2,507	74,740	70,863	27,836	250,003	12,964	97,367	14,682	26,573	321,194	557,817	2,064,821
Colombia	34,016	861	43,772	10,914	5,651	105,582	33,186	343	48,280	5,189	11,692	114,339	2,986	8,557	12,202	115,056	40,412	196,313	689,351
Ecuador	3,299	156	5,071	132	1,256	7,613	5,905	546	5,370	803	1,240	7,207	118	3,010	.....	2,244	6,418	23,591	74,179
British Guiana	6,815	257	298	79	199	6,814	4,076	84	5,800	2,085	3,296	3,589	148	795	25	1,218	35,340	.....	70,888
French Guiana	.....	.....	19,107	.....	.....	1,912	.....	.....	441	257	.....	941	.....	6,283	7,124	1,622	270	12,810	50,767
Peru	24,430	617	96,183	2,995	20,985	111,610	44,783	5,429	106,239	10,193	6,102	225,156	8,746	48,578	3,104	46,552	150,392	571,806	1,501,960
Uruguay	22,603	159	3,610	9,486	43,750	68,589	26,994	2,087	67,110	19,395	8,298	52,170	1,974	19,105	423	9,573	2,735	91,817	449,878
Venezuela	34,839	1,991	37,294	4,999	2,349	37,611	13,842	1,731	38,709	7,841	4,313	62,053	4,195	9,898	73,524	23,507	30,778	120,738	510,217
China	65,541	2,103	552,980	110,460	33,462	139,694	60,604	3,492	50,517	17,336	127,996	735,897	8,742	386,235	2,404	120,591	711,740	944,873	4,086,566
Kwantung	1,204	.....	3,529	.....	9,222	6,983	.....	.....	.....	5	4,159	15,571	2,402	4,450	.....	10,109	819	21,671	80,284
British India	83,513	280	376,651	83,373	14,709	286,292	22,154	1,535	24,819	39,995	20,951	898,375	35,872	79,979	27	120,252	251,356	903,055	3,394,616
Straits Settlements	13,247	.....	23,004	8,562	4,545	2,936	7,119	28	6,567	12,043	345	16,580	1,165	575	1,500	96	5,450	36,454	140,216
Dutch East Indies	54,615	1,157	132,647	3,330	7,082	121,919	21,487	125	40,869	18,586	21,837	154,180	36,317	118,849	7,547	209,938	103,121	321,279	1,274,885
Hongkong	11,732	262	11,916	30,705	2,598	2,596	17,306	.....	9,064	3,523	33,993	50,385	409	3,246	6,914	5,079	25,615	48,787	264,130
Japan	71,652	52,782	1,755,041	16,100	91,337	109,571	35,863	10	607	49,805	536,769	1,554,504	235,659	328,385	59,523	233,289	1,082,485	3,346,526	9,631,086
Siam	6,071	.....	1,274	5,163	5,212	860	6,139	.....	1,661	4,121	3,521	21,324	272	2,271	50	3,119	26,177	15,816	103,051
Australia	185,156	2,539	327,449	21,480	110,336	156,086	121,415	1,485	265,779	77,446	306,275	2,373,722	135,156	242,458	24,785	682,908	908,813	1,495,153	7,433,441
New Zealand	171,928	58	123,698	930	59,986	162,983	29,838	760	62,006	20,623	81,494	329,454	17,481	34,454	4,586	149,627	264,272	412,335	1,928,339
Philippine Islands	106,075	2,573	101,990	32,827	15,486	175,235	37,461	5,497	54,179	34,685	53,461	231,558	8,862	89,880	19,134	104,730	51,040	399,887	1,324,560
British South Africa	96,504	945	302,755	4,998	80,785	83,200	12,165	557	70,162	23,410	57,862	719,465	41,075	73,382	3,451	8,455	201,280	519,394	2,349,047
Egypt	2,338	4,134	3,291	1,353	2,367	1,683	6,470	.....	6,208	2,287	5,871	13,941	9,982	3,038	.....	57	.....	23,779	86,399
All others	61,494	346	15,253	16,934	8,032	19,889	22,676	668	22,771	19,142	10,042	52,068	2,579	3,778	23,706	19,260	14,195	163,580	476,478
Total per item	3,831,738	433,869	7,942,473	1,270,253	1,637,450	8,573,820	1,848,793	125,045	3,148,635	1,313,614	2,726,448	15,444,564	1,044,393	4,033,299	1,010,891	4,797,923	7,988,440	28,628,982	95,814,885

THE WEEK
IN TRADE

Prices When Quoted Are Those Prevailing at the Opening of Business on Monday of This Week for Points West of the Mississippi River and on Tuesday for All Eastern Points

WHAT little tendency the market has shown during the past week has been toward further small downward readjustments. There are few of any consequence, and the impression is given that jobbers and manufacturers are getting their prices down as low as possible with the hope of starting a healthy buying movement. The drops in jobbers' quotations reported from various cities include reductions of 20 per cent on sewing machines, 10 per cent on boxes and several other items of wiring material, 7½ per cent to 15 per cent on motors, 5 per cent on pole-line hardware, and weaker quotations on porcelain, rubber-covered wire and flexible armored conductor.

Several large building projects, among them a hotel and an office building, have been proposed in Boston, and residence construction there continues very good. New England business is reported to have been somewhat disturbed by the textile strike. Cotton has had a remarkable rise in the last two weeks, and the territory around Atlanta is optimistic once more.

NEW YORK

The moderate increase in the demand for wiring supplies from the suburban sections continued during the past week. Jobbers feel that this is the forerunner of renewed buying activity, particularly as many of the orders are for larger quantities than heretofore. Of course, most of this business now is the result of work under way on small residential jobs, but it is an encouraging sign. The demand from industrial sources for electrical supplies is still spasmodic and uncertain, so that there is little definite trend to this class of business.

A few changes in prices of standard materials have been made. Quotations on rubber-covered wire and flexible armored conductor are somewhat softer without any definite changes being reported. Two manufacturers have dropped their prices on flush receptacles and plug cut-outs, and an additional 5 per cent discount is allowed on gang boxes. Jobbers' stocks generally are in very good shape.

Rigid Conduit.—Demand and prices for this material remain at the same levels as last week. Jobbers' stocks are fair to good, with quotations as follows: For ½-in. black pipe in 2,500-ft. lots, $44 to $45; ¾-in., $57 to $58, and 1-in., $82 to $83 per 1,000 ft. Galvanized pipe in the same sizes and quantities was quoted at $49 to $50, $64 to $66 and $91 to $93 per 1,000 ft.

Flexible Armored Conductor.—Apparently in sympathy with the wire market, armored conductor shows a tendency toward easier prices. Quotations on No. 14, two-wire, single strip, however, remain at $43 to $45 per 1,000 ft., and double-strip is $45 to $47 per 1,000 ft. in that quantity. It is rumored that in some quarters these prices have been shaded. Jobbers' stocks are good and manufacturers are making prompt deliveries.

Flush Receptacles.—Revision of prices by manufacturers has caused a drop of between 30 and 35 per cent in the price of single and duplex flush receptacles. Single receptacles, which formerly were quoted at 40 cents each in lots of 100, now sell for 25 cents each in that quantity. Duplex receptacles, which were 55 cents, are now quoted at 38 cents apiece in lots of 100.

Gang Boxes.—The discount on black enameled gang boxes in standard-package lots has been increased from 50 to 55 per cent, a decrease of 10 per cent in price.

Plug Cut-outs.—Prices on plug cut-outs have been dropped about 20 per cent by an increase in discount from 50 to 60 per cent.

Porcelain.—The interest in radio equipment has slightly increased the demand for this material, which is never very active in this section. "Nail-it" knobs are quoted at $16.80 per 1,000 in barrel lots and ⅞-in. x 3-in. tubes at $6.90 per 1,000 in the same quantity.

Tape.—Demand is in line with that for other wiring supplies. Both friction and rubber tape is quoted at 36 cents a pound in 100-lb. lots.

Radio.—Jobbers continue to be flooded with requests for radio apparatus, with little possibility at present of obtaining any stock of either complete sets or separate parts. Dealers report a keen demand from customers for radiophone outfits and equipment, and many purchasers appear willing to buy almost any kind of apparatus that can be utilized. It seems possible that under present conditions much equipment of inferior quality may find its way into the hands of the public.

CHICAGO

Electrical business the past week has progressed fairly well. The only price changes were a reduction on rubber-covered wire and conduit. The market situation on wiring materials is spotty and reports from dealers are varied. As a whole this line is selling in fair amounts. Several good orders for high-tension equipment have been filled. The motor line is still marking time, although an increasing activity has been noticed. Radio apparatus continues to be the best moving material.

Wire.—In almost all cases jobbers have reduced the price of No. 14 rubber-covered wire so that it is now available in 5,000-ft. lots at $6.40 to $6.50 per 1,000 ft. It is moving fairly well and dealers' stocks are ample. Weatherproof sells for 16½ cents per pound in 1,000-lb. lots and the demand has been steady. The bare-wire base is about the same, and owing to the impetus of the demand for radio this line is moving very well. Stocks are not large.

Flexible Armored Conductor.—This is selling in small lots and the No. 14 double-wire, single-strip, is quoted at $43 per 1,000 ft. in 5,000-ft. lots. The double-wire, double-strip, sells for $45 per 1,000 ft. in the same quantity.

Rigid Conduit.—A price reduction has been noted on conduit, the ½-in. black pipe now selling for $42.50 per 1,000 ft. in 5,000-ft. lots. The movement has been steady, and stocks are in most cases large enough to supply any need.

High-Tension Equipment.—An order for 66,000-volt outdoor disconnecting switches and choke coils for a Middle Western utility was reported by one company. This manufacturer also shipped some 110,000-volt, three-phase air-break switches to a Scandinavian company. Another company has filled a large order for a complete distribution system in Australia. Series street-lighting equipment has been purchased by three Middle West cities. Equipment for a 45,000-volt outdoor substation in Kansas was reported by another company.

Dry Cells.—Movement has been satisfactory at $30.65 per barrel lots. Stocks are ample.

Lamps.—The mill-type lamp is selling well, while the larger sizes are also moving steadily. The mainstay of the lamp business has been the sale of lamps for home lighting, since most of the industrial plants have not been in the market.

Radio.—The sale of this apparatus is still as heavy as at any time in the last two months. The one objection is that the stocks on hand are low. Manufacturers, however, are constantly increasing their production.

Power Transformers.—Activity has been restricted to the replacement of obsolete equipment, few orders for new distribution transformers having been recorded. Dealers feel that business will pick up when the spring construction of new lines starts. Stocks are ample.

BOSTON

Business shows further tendencies toward improvement, notwithstanding the adverse effects of widespread textile strikes in New England. Rapid gains in the volume of trade are not in evidence, and individual manufacturers and jobbers vary greatly in their reports of conditions. Building and engineering contracts for the week ended Feb. 20 totaled $1,439,300 compared with $2,796,300 a year ago, but within a few weeks this industry is expected to improve substantially. New car repair shops, to cost about $4,000,000, are scheduled for construction this spring by the Boston Elevated Railway, and plans are being made for a very large office building structure to cost about $5,000,000 in the Park Square district. Curtailment of production in textiles due to labor troubles has begun to affect the sale of electrical material somewhat. Price readjustments continue to be announced every few days in electrical material, but no decided change either way is general. The jobbers are buying carefully and retailers are paying closer attention to good merchandising, working hard for sharply competitive business.

Lamps.—Lamp sales in general declined somewhat last week, owing to withdrawal of textile-mill buying. One distributer, however, reports a slightly larger sales volume for January and February than last year. Sign lighting is sluggish. Lamp prices are steady.

Radio Apparatus.—Demand for wireless telephone equipment grows like a rolling snowball. A representative manufacturer reported last week that deliveries are now quoted in midsummer. Increased broadcasting facilities and newspaper publicity are stimulating an extraordinarily brisk trade.

Electric Ranges.—An improvement in production is expected soon, in view of the activity of central-station commercial departments in planning campaigns for the coming warm season. Immediate business is rather quiet, but everything is in readiness for larger outputs.

Pole-Line Hardware.—Sales are increasing slightly and inquiries are more active. Prices are firm.

Wire.—Moderate demand features the market. Rubber-covered wire in the No. 14 size is selling at $7.25 per 1,000 ft. in 1,000-ft. lots, and at $6.75 in 5,000-ft. consignments. Little bare wire is moving, the base being 15 cents this week. Weatherproof base is 15½ cents, with only scattering demands. Stocks are easily meeting requirements.

Dry Cells.—A good demand is reported, with firm prices and excellent deliveries. Hardware stores are absorbing substantial quantities of cells for flashlamp renewals. In barrel lots, No. 6 cells move at $30.35 per 100, the igniters quoting $31.35.

Alkaline Batteries.—Business is quiet, but increasing interest in electric delivery outfits for laundry work is apparent. Prices are steady, barring a recent reduction in the price of electrolyte from 12 to 10 cents per pound.

Appliances.—Lamp-socket devices are moving slowly in comparison with the volumes handled by jobbers and retailers a few weeks ago, but a fair business rewards energetic solicitation. Vacuum cleaners are picking up somewhat, flatirons are not selling badly, and hollow ware is going to the public acceptably. Little is heard about prices as affecting the sale of the lighter appliances.

ATLANTA

A slight betterment in general conditions is in evidence this week, due probably to more pleasant weather conditions and the ability of the rural population to see an opportunity for some out-of-door activity. The hardware stores, as a result, are reporting some increases in the sale of agricultural necessities and a very satisfactory turnover in building hardware. Building permits in the larger centers continue to show very healthy activity. The spectacular increase in the value of cotton during the past few days will lend a healthy tone throughout the rural sections and will be reflected in the liquidation of old accounts and, at the same time, stimulate purchases, the rise having amounted to about $13.20 a bale from the low level of last month. As yet, however, little or no marked change in the activity of the electrical jobbing lines is reported, the movement of seasonal specialties apparently being held up by the combination of short funds and the inclement weather that has existed up to the past week.

Wire.—A price reduction from a 17-cent to a 16½-cent base on weatherproof was announced recently. Popular sizes of both weatherproof and rubber-covered are moving fairly well, but there is a slowness noted in the larger sizes.

Sewing Machines.—While some movement is to be noted, the trade is not responding to the efforts of the jobbers as well as might be desired. A price reduction of 20 per cent is assisting somewhat in the movement, though stocks continue to be good to heavy.

Meters.—A steady demand is reported, particularly in the 5-amp. and 10-amp. two-wire and three-wire types, the two-wire type in the 5-amp. size being the most in demand. Stocks are reported in good shape.

Fans.—While jobbers have closed contracts for very fair quantities, they have not yet begun to ship to the retail trade. Prospects are good for the coming season, especially in view of a price reduction of approximately 10 per cent, and satisfactory contracts are expected to materialize.

Armored Conductor.—Residential construction and wiring of old houses is creating a ready market for the popular sizes, the two-wire, No. 14 single-strip type leading the field. Prices have stabilized and stocks are reported in good shape.

Flexible Non-Metallic Conduit.—Only a fair amount of orders is reported for this material, the market not having entirely recovered from the heavy stocking of a few months ago. Prices are steady with good stocks on hand.

Lamps.—The last season has been quite satisfactory, though the failure of some of the large industrial plants to make their normal purchases has held the demand below that anticipated. All of the smaller size lamps up to 100-watt are active, with the 40-watt most in demand, while the 100-watt and 250-watt, type C lamps continue very popular.

Washing Machines.—It seems almost impossible to reawaken activity in this line, very few retail sales being in evidence. Sharp price reductions are going to be necessary to move the heavy stocks in the territory.

Outlet Boxes.—A price reduction of 10 per cent became effective on Feb. 20, with sales reported as fairly good. Local stocks are in good condition.

ST. LOUIS

Price recessions made last week tended to break the monotony existing in the jobbing field here, lower prices being announced on motors, outlet boxes, weatherproof wire and pole-line hardware, with a noticeable wavering in porcelain prices. Volume of business continues on about the same basis, but the business obtained last week caused some to feel that an early improvement is coming. Inquiries for wiring materials are more numerous and for larger amounts. Residential construction work is opening up in an encouraging manner, and the industrial field shows some improvement. It also appears that there will soon be an improvement in the amount of distribution-system extensions in the small towns. The volume of such work in St. Louis has been good for some time and now is showing further improvement.

Radio equipment has increased enormously in demand since broadcasting was recently put into effect in St. Louis, and the usual difficulties are found in obtaining deliveries. As a result of this new field those handling radio equipment are enjoying a business with its profits which others are unfortunately lacking.

Motors.—Revised prices are out, giving reductions varying from about 7½ per cent to 15 per cent. The principal demand is for sizes up to 25 hp., this demand having improved somewhat in the last few weeks. Most of the sales were for out-of-town plants. Fractional-horsepower motors

are also reported to be selling better. Local stocks are in good shape in all sizes up to 150 hp., and early delivery can be given on all larger sizes.

Wire.—Prevailing prices on rubber-covered were reduced last week, one jobber reducing the price on No. 14 rubber-covered in 5,000-ft. and 10,000-ft. lots from $6.60 per 1,000 ft. to $6.25 per 1,000 ft. The demand is also showing some improvement, principally for No. 14, as residential building is steadily increasing in volume. The base prices on bare and weatherproof remain the same, that on bare being around 16.35 cents per pound and that on weatherproof being generally quoted at 16 cents per pound.

Pole Line Hardware.—Prices are lower by about 5 per cent. Movement continues to be slow, though inquiries have improved somewhat in the last few weeks. One jobber reports that the volume of business is only about one-half of that obtaining at this time last year.

Porcelain.—Prices are in the process of adjustment downward, and definite quotations have not been determined. The reduction promises to be about 10 per cent, which will bring "Nail-it" knobs to about $17.50 per 1,000, 2½-in. tubes to about $5.50 per 1,000, 3-in. tubes to about $6.25 per 1,000, and cleats to about $13.50 per 1,000—all prices being for barrel lots. Inventories will not be seriously affected as stocks have kept low. The demand showed some improvement for the week.

Outlet Boxes.—Prices were lowered about 10 per cent last week, representative quotations now being as follows, for orders of 100 or more: 3¼-in. round black, $7 per 100; 3¼-in. round galvanized, $8 per 100. Sales continue in about the same volume, and stocks are small.

Lamp Cord.—Following are representative quotations for lots of 5,000 ft: No. 18 twisted cotton, $11 per 1,000 ft.; No. 18 twisted silk, $27 per 1,000 ft.; parallel silk, $27.60 per 1,000 ft. Stocks are generally in good condition, but the demand is falling off.

Safety Switches.—A healthy condition is found in this line, with stocks low and with demand improved and substantially better than a year ago. The size finding the principal demand is the 30-amp., two-wire and three-wire.

PORTLAND—SEATTLE

General business conditions continue slow, but the tendency is toward a very gradual improvement. Lumber production for the week ended Feb. 18 was only 10 per cent below normal. New business was 12 per cent below production, with shipments practically equalling new business. Lumber camps are gradually opening up and will continue to do so until all of the snow in the mountains disappears. Wages, however, are very low, the scale for common labor now being about $3 a day. Although there is considerable non-employment, the general situation affecting employment has improved considerably in recent weeks. This is due to improved conditions in the lumber industry, the beginning of road work and the activity in building.

The electrical trade shows little change from week to week. Business is still slow, but active inquiries indicate that improvement may be looked for. Prospects for an active demand for pole-line material and wiring devices are very good. Portland reports that activity in electric ranges is also very promising. Particularly is this true in respect to the many new apartment houses now being planned. The big question locally nowadays in regard to the better class of apartment houses seems to be not whether they will install gas or electric ranges, but rather what particular type of electric range will be installed.

Dealers report business slower than for January, but as being approximately normal for this time of year. Contracting business is picking up, and the prospects are good, although competition is very keen. Owing to the great amount of construction under way fixture business is quite active.

Household Appliances.—A drop of about 5 per cent is reported on certain types of washing machines and about 10 per cent on ironers. Sewing machines are also showing a drop of about 5 per cent.

Wire.—The demand for wire continues about normal. No. 14 is quoted at $7.50 and No. 12 at $7.90 per 1,000 ft. in 5,000-ft. lots. Bare copper wire dropped from a 15½-cent base to a 15-cent base, effective Feb. 23.

Rigid Conduit.—This material is moving very well. Prices remain unchanged, although further reductions are expected. Stocks are in good shape in all sizes.

Radio Apparatus.—The wide popular interest in radio communication which has sprung up since radiophone broadcasting has become general has created an excellent demand for radio apparatus. At the present time a considerable shortage exists in some sections, and customers often find it impossible to get what they want from local stocks. The demand for portable sets is growing rapidly. Many of these sets will be used by outing parties during the summer season, dealers report.

SAN FRANCISCO

There is an unusually heavy amount of snow on the Sierra summit, providing ample irrigation for the coming crops. Twelve feet of now is reported at the summit packed by the recent rains so that it will store well. Business has been considerably impeded by the influenza epidemic, which, although not serious in itself, has considerably disturbed production.

Lamps.—Especially keen efforts are being made to improve the efficiency of agents. The manufacturers, instead of appointing new agents, will attempt to get new business this way. Lamp business has been good this winter.

Ranges and Water Heaters.—A survey of installations over the lines of California power companies indicates an increase in recent months of about 30 per cent in the number of ranges on the line and an even greater percentage of increase for water heaters. About 50 per cent of the range installations are accompanied by water heaters. This increase is largely accounted for by the efforts of companies in the northern and central parts of the state. At the present time two distinct methods are being advocated, one providing that the power company sell at cost to popularize the use of the range and for the present at least disregard the dealer. The other method, which is being overwhelmingly advocated and will probably become effective in the near future, allows the dealer a handling profit and invites his co-operation. Approximately 100 ranges a month are now being added to the power lines around San Francisco Bay.

SALT LAKE CITY—DENVER

There are several favorable indications relative to business conditions in the Intermountain country. Reports show a steady increase in output in most of the basic industries. The copper industry is getting in better shape, gradual resumption being the tendency. Steel and iron have shown about a 10 per cent increase in the past sixty days. Coal production continues at a satisfactory rate. Farm products are gradually finding their way to the country's markets. Packing plants are also getting orders for their products at a better rate. The money market is considerably easier, and capital for building purposes is plentifully available at around 7 per cent. This is a better rate than has been in effect for several years, and it is believed certain that it will stimulate construction in a substantial way.

The market for electrical merchandise is rather sluggish, retailers placing small orders and jobbers generally trying to reduce their stocks to a more consistent level. The usual spring drive on washers and vacuum cleaners is beginning. Some liberal advertising campaigns are being mapped out, and with lower prices prevailing there is every reason to look forward to a good season.

Fixtures.—Dealers who feature electric lighting fixtures report a disappointing season. In a period of economizing there have been few replacements in homes, and with building at a low ebb new installations have been few. Stocks are somewhat excessive at the present time.

Manufacturers' Activities

Devoted to the Business Side of Manufacturing, Distribution and Sales, News from Jobbers and Foreign Fields and a Record of New Devices and Trade Literature

Wakefield Brass Reports Increasing Business

Substantial increases in business are reported by the F. W. Wakefield Brass Company, Vermilion, Ohio, manufacturer of lighting specialties. In addition to regular production of the company's "Red Spot" hangers for commercial lighting units, the Wakefield plant has been engaged upon a considerable order for suspensions for "Keldon" units for the Ivanhoe-Regent Works of the General Electric Company. Output since the first of January is about 100 per cent above the same period last year.

Repair Company Erects New Factory

The American Electric & Maintenance Company, 51-57 Taylor Street, Springfield, Mass., which specializes in the repair of electrical machinery of all kinds, is erecting a new building in that city at 128-130 Liberty Street. The company expects to occupy its new quarters on April 1. Most of the sales and factory effort of the company at the present time is being devoted to the rewinding of transformers for central stations. F. R. Collins has just become connected with the company and will devote his time to central-station sales work. A. M. Sofield is president and general manager, and E. G. Young is vice-president.

MacGovern & Company Reorganize and Expand

The business of MacGovern & Company, Inc., Engineering Building, New York, has been reorganized, and new capital has been obtained, according to the announcement of Nathaniel F. Paige, formerly of the General Electric Company, who recently has been made vice-president and general manager. The company is well known among public utilities, steam and electric contractors and industrials, its business consisting of the purchase and sale of all kinds of new and used electrical and steam machinery and equipment. A new company has been incorporated under the same name and will take over all the assets and liabilities of the present corporation. The old company was incorporated in 1912.

The plant of the company is at Linden, N. J., on the main line of the Pennsylvania Railroad, the property including six acres of shops, land and sidings, fully equipped. Executive offices are maintained in the Engineering Building, New York, and branch offices in Montreal, Pittsburgh and Seattle, while it has sales representatives in most other important cities of the country. A large foreign business is done through the Montreal office and other connections, central-station and industrial apparatus being sold through these channels in the Canadian territory as well as Japan, China and other Far Eastern points.

The new board of directors includes Frank MacGovern (president), Nathaniel F. Paige (vice-president and general manager), Herman J. Woltman (vice-president), H. G. Scott, J. B. Spencer (treasurer), Howard H. Nieman (secretary), and Charles F. MacDonald. In its statement announcing the change the company expresses its confidence in steadily increasing business and its belief that its financial expansion will enable it not only to maintain its present business but materially to widen its distribution and service.

Trumbull-Vanderpoel Deliveries Not Delayed by Fire

Although the warehouse of the Trumbull-Vanderpoel Company, Bantam, Conn., was recently destroyed by fire, the company has stated to the ELECTRICAL WORLD that deliveries have not been affected. The company manufactures switches, switch and panel boards and cabinets. The main plant was uninjured by the fire, but the warehouse in which were stored three carloads of box lumber and a large supply of slate and porcelain was a total loss. This material was replaced promptly, and deliveries, it is stated, can be made on a normal basis. The loss was estimated at $30,000. A fireproof warehouse will be constructed, though plans have not been made to do this work at once.

New Chicago Jobbing House Established

The Electrical Supplies Company, 511 West Jackson Boulevard, Chicago, has been organized to engage in the electrical jobbing business with A. A. Togesen as manager. The announcement made in the Jan. 28 issue of the ELECTRICAL WORLD stating that this company had been formed from the Crescent Electric Company was incorrect, as the Crescent Electric Company has moved to 562 West Van Buren Street and will continue in the electrical contracting business. F. C. Reimers, who had been manager of this concern, will continue to act in this capacity.

Medart Adopts New Name

The name of the Medart Patent Pulley Company, Inc., has been changed to the Medart Company, effective Feb. 20, according to the announcement of W. R. Medart, president. The change was made for the reason that the phrase "patent pulley" failed to indicate the whole line manufactured by the company and was in effect misleading. The company started in 1879 to manufacture steel-rim pulleys, but later this line was extended to include all kinds of mechanical appliances for the transmission of power. The change, it is stated, does not mean a reorganization and will not apply to the ownership, policies or personnel of the company.

The company was originally a copartnership, with Philip and William Medart as the partners. The only thing manufactured at the time was the Medart patented pulley, so that the name chosen was clearly indicative of the business at that time. The founders of the business died about ten years ago and the management of the company came into the hands of Walter R. Medart, who incorporated it in 1913 and became its president and treasurer.

Nesbitt Succeeds Canadian Krantz Company

The Nesbitt Electric Manufacturing Company, Ltd., 95 King Street, East, Toronto, has been organized to succeed the Canadian Krantz Company. The new company will manufacture and sell in Canada the equipment formerly manufactured by the Canadian Krantz Company, such as panelboards, switches, switchboards, motor starters and other equipment. R. H. Nesbitt is president of the new organization, A. Ross Osborne is vice-president, and Walter, Warren, until recently manager of the Central Electric Supply Company, is treasurer. The offices of the Krantz Manufacturing Company are at 160 Seventh Avenue, Brooklyn, N. Y.

Better Demand for Passenger "Electrics"

Orders for passenger electric vehicles since Jan. 1 have exceeded those in the last half of 1921, recently stated H. H. Doering, sales manager for Rauch & Lang, Inc., Chicopee Falls, Mass., to a representative of the ELECTRICAL WORLD. Since starting production about a year ago at the new factory, the plant has been running on full time, although some reduction in forces was necessary during the year. Mr. Doering stated that the company sold six "Electrics" each at the New York and Chicago automobile shows and that a remarkable increase in "prospects" resulted from these and other displays. The Eastern seaboard is recovering more rapidly than other parts of the country from the depression. New representatives have been arranged for in various places, and the bringing out of a new model car has been a factor in recent improved sales. Mr. Doering believes

that the passenger electric vehicle will come into its own in 1922 and pointed out that, with the exception of one or two makes of gas cars, more publicity was accorded "Electrics" at the recent New York show than to any other type.

The distributers added to the company's connections are as follows: Rauch & Lang Electric Company of Chicago, J. P. O'Brien manager, 2416 Michigan Avenue; Electric & Gas Car Garage, Omaha, Neb.; Russell Electric Car Company, Kansas City, Mo.; Bottom Brothers Motor Company, Tulsa, Okla.; United Motors Company, Louisville, Ky., J. C. Boyd manager; Schnake Electric Car Company, Evansville, Ind., Walter Schnake proprietor; and E. F. Upson, 412 Church Street, Hartford, Conn.

Business Improving at New England Westinghouse Plant

A marked improvement in business arising chiefly from increasing popular interest in radio telephony and telegraphy is in evidence at the East Springfield (Mass.) factory of the Westinghouse Electric & Manufacturing Company. A. B. Reynders, factory manager at East Springfield, informed the ELECTRICAL WORLD last week that 150 more employees have just been added to the payroll and that a total force of about 1,500 is now at work on a five-and-a-half-day weekly schedule. Vigorous efforts are being made to shorten deliveries on radio equipment, and at present the principal factor in deliveries is the demand for material used in making this class of apparatus. While the demand for small motors for appliance applications is not varying much either way at present at East Springfield, there is a better feeling in the market for automotive starting and lighting sets which is now reflected in orders being put through the factory at the present time.

A drive for "over-the-counter" sales of small motors has been initiated by the company, and according to the announcement good results are expected from this method of selling small motors. The plan, though not altogether a new one, has not been extensively tried before this time, but the Westinghouse company believes that there are many practical uses for small motors both in the home and in commercial and small industrial establishments, few of which are now being exploited by the motor manufacturer. To help its dealers and the public the company has issued a booklet entitled "Popular Motor Mechanics" in which are described many methods of putting small motors to work on tedious jobs. Among the illustrations of the applications that can be made are motor-driven ice-cream freezers, grindstones, erasers for drafting rooms, forge fans, revolving window displays, egg, cream and batter beaters, sewing machines and a number of others. The booklet also contains a short description of simple motor mechanics for the layman.

Slate Producers Confer to Decrease Cost, Increase Use

A gathering of producers and users of slate was held at the Engineers' Club, New York, on Feb. 8, with the object of discussing methods of reducing production costs and increasing demand for slate. This conference follows one held recently in Washington with government officials with the same object in view. Large use has been found for slate in electrical switchboards, but, according to statements made at the conference, consumption of the product has been seriously curtailed. Producers of slate, it was declared, had decreased in number about 50 per cent in the past few years.

The most promising outlook for slate is in the electrical field, according to a talk made by G. F. Loughlin, United States Geological Survey.

"We are living in an electrical age," said Mr. Loughlin, "and recent indications, for example the Superpower Survey completed last summer, give hope of accelerated development of electrical power. The instructive tests on electrical slate recently completed for the Structural Slate Company of Pen Argyl, Pa., give us some much needed facts as to the adaptability and limitations of slate for electric switchboards and should aid in gaining proper recognition for slate in this field."

A continuance of the efforts at standardization and the formation of a distinct body to promote use of slate were recommended as means of increasing sales and getting the industry back on its feet.

Suction-Cleaner Manufacturer Moves to Own Building

The F. Bissell Company, Toledo, Ohio, jobber of electrical supplies and power apparatus and manufacturer of suction cleaners, has recently moved from 226-230 Huron Street to its own building at 812-822 Lafayette Street. The new location covers practically a half block, permitting the company to combine all of its departments and stocks under one roof, with the exception of the lighting-fixture studio, which is being continued under the original plan of using a large residence for display and sales rooms.

The concentration of stocks and modern handling methods, which include a completely inclosed and heated driveway and loading docks and a railroad siding into the building, together with the proximity of all outbound freight stations, will enable the Bissell Company to increase service to the trade.

Crossarm & Conduit Company Changes Name

The American Crossarm & Conduit Company is the new name of the company formerly called the American Line Materials Company. The change in name became effective on Jan. 31. The main offices of the company are in the McCormick Building, Chicago.

The Varney Electrical Company, Evansville, Ind., is planning for extensions in its plant and operations. The capital has been increased from $250,000 to $400,000. H. A. Robertson is manager.

The A A Wire Company, Newark, N. J., has opened a new branch office in Cleveland to handle the business in that city and the territory contiguous to it. A. B. Barker is opening up this branch, established in the Sloan Building, 815-23 Prospect Avenue.

The Wilson Welder & Metals Company, 132 King Street, New York City, manufacturer of arc-welding machines and certified welding metals, announces the appointment of R. L. White as district manager in charge of the Detroit office at 809 Kresge Building.

The Hardinge Company, 120 Broadway, New York City, announces that it has acquired the coal-washing equipment, consisting mainly of the James automatic balanced jig, formerly supplied by the Coal Washing Equipment Company, Pottsville, Pa., and another device, which is a combination of pulsating classifier and table, capable of lowering the sulphur and ash content of slack sizes of coals and of washing river coals and anthracite culm. All of this equipment is now manufactured in the shops of the Hardinge Company.

The Roller-Smith Company, 233 Broadway, New York, has appointed Pendleton E. Lehde, 609 Whitney Central Building, New Orleans, as a special representative in Louisiana and the southern part of Mississippi. He will handle the Roller-Smith Company's line of electrical instruments, meters and circuit breakers in that territory.

Betts & Betts Corporation, 645 West Forty-third Street, New York, manufacturer of electric sign flashers, etc., has engaged F. R. Ewing, formerly with the Western Electric Company, New York, to do sales work in southern Wisconsin, Illinois, Michigan, Indiana and western Ohio. The territory of V. H. Walker has been extended to include New Jersey, Pennsylvania, Maryland, Delaware, Virginia, District of Columbia and West Virginia.

The Efficient Electrical Display Company, Inc., 26 Court Street, Brooklyn, N. Y., has announced that it is intending to increase its production to about 100 large signs per month and is in the market for equipment for this purpose. Later on in the year, according to Walter T. Fassig, president, the company intends to buy about 15,000 two-piece sign receptacles and 20,000 ft. of No. 14 rubber-covered wire.

The Cutter Electrical & Manufacturing Company, Philadelphia has awarded contracts for a large addition to its factory at Nineteenth and Hamilton Streets.

The Oriental Fixtures Company, 1318 Ridge Avenue, Philadelphia, has gone into the hands of a receiver. Joseph Selzman has been appointed by the courts to make settlement.

Foreign Trade Notes

ELECTRIFICATION OF THE OTIRA TUNNEL, NEW ZEALAND. — The Otira tunnel in New Zealand, which cost £800,000, according to *Electrical Industries*, is nearing completion. The tunnel will be equipped for electrical operation, which will add £382,000 to the cost of the project.

PROPOSED WATER POWER DEVELOPMENT IN NEWFOUNDLAND. — Negotiations are under way between the Newfoundland government, Messrs. Armstrong and Whitworth and the Reid Newfoundland Railway Company, according to *Electrical Industries*, regarding a proposed water-power development on the west coast of Newfoundland. It is estimated that a total of 235,000 hp. could be developed, which would be utilized in connection with a proposed paper mill with a daily capacity of 400 tons of newsprint paper, a factory for smelting aluminum and other industries. The associated companies have asked the government to guarantee the interest on £4,000,000 at 6 per cent, with a sinking fund of 1 per cent for thirty-seven years.

HYDRO-ELECTRIC PROJECTS IN TASMANIA.—Owing to the high price of money, according to *Electrical Industries*, no new developments are proposed in this year's estimates in connection with the large hydro-electric scheme of the Tasmanian government.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

An American having an established mercantile business in Australia (No. 845) is in the United States and desires to secure an agency for the sale of household labor-saving devices, etc.

A business man in Persia (No. 848), who is soon to organize a commercial house for the importation of goods, wishes to receive catalogs and samples with a view to selling electrical apparatus, etc.

A manufacturing company in Canada (No. 862) wishes to purchase about 5,000 round electric lamps per year, 1¼ in. in diameter and ½ in. thick, of about 20 cp., with medium-sized sockets, to be used at the bottom of artificial flowers; also artificial flowers and rose petals, fireproof, to be used on portable electric floor lamps.

Inquiries have been received by an American consul in Canada (No. 878) for amateur wireless telegraph outfits and catalogs and price lists are requested.

A merchant in Spain (No. 907) wishes to secure an agency for the sale of electrical machinery, supplies and novelties in the electrical trade.

The purchase is desired by a mercantile firm in Canada (No. 943) of an electric generating outfit of from 6 kw. to 10 kw. capacity, 110 volts, generator either belt-driven or directly connected to kerosene, gasoline or crude oil engine. An agency is also desired.

An automobile salesman in Spain (No. 950) desires to purchase accessories for motor cars, such as lamps (electric and carbide), speedometers, motormeters, horns and sirens, etc.

A firm in Norway (No. 960) desires to secure an agency for the sale of technical specialties, apparatus, equipment and supplies for mines, steamships, forestry and timber, etc., and practical and handy tools, specialties and patents for the automobile, motor cycle, and electrical lines.

New Apparatus and Publications

SUPERHEATER.—The Whitlock Coil Pipe Company, Hartford, Conn., is distributing bulletin No. 30, describing its all-steel superheater.

WIRING DEVICES.—"Ben-ox" interchangeable wiring devices for suspending industrial and commercial lighting units are described by the Benjamin Electric Manufacturing Company in its bulletin No. 19.

REFLECTOR.—The Standard Corporation, Columbus, Ohio, is distributing a leaflet describing and illustrating its reflectors for flashlights, locomotive headlights and floodlights. A new lens developed by the company is also described.

COMMERCIAL LIGHTING.—The Brascolite Company, St. Louis, has issued No. 4 of its series of booklets describing the use of "Brascolite" lighting units. This booklet deals with commercial lighting.

INDEXES.—The General Electric Company, Schenectady, N. Y., has issued indexes to its descriptive bulletins and sheets and supply-part bulletins, dated January, 1922.

PHOTOGRAPHIC ARC LAMP.—The Photogenic Machine Company is distributing a leaflet describing its "Hi-Power" twin-arc lamp for photographic processes.

FOOD MIXER.—The Reynolds Electric Company, 2650 West Congress Street, Chicago, is distributing bulletin No. 301, describing the "Reco" food mixer.

AMPERE-HOUR METER.—The Sangamo Electric Company, Springfield, Ill., has issued bulletin No. 58, superseding bulletin No. 50, describing its locomotive type ampere-hour meter.

SWITCHES. — The Trumbull Electric Manufacturing Company, Plainville, Conn., is putting on the market a new line of externally operated punched-clip-type "C" switches, 30 amp. to 200 amp., two, three and four-phase, 250 volts to 500 volts.

New Incorporations

THE BOSTON (KY.) LIGHT & POWER COMPANY has been incorporated with a capital stock of $2,000 by R. W. Atcher, N. B. Langsford, and Charles E. Sprigg, all of Boston, Ky.

THE OAKVILLE (ONT.) ELECTRIC, LTD., has been organized with a capital stock of $5,000 for the purpose of distributing hydro-electric power in Oakville. H. C. Christie is president.

THE VERA LIGHT & POWER COMPANY has been organized at Tulsa, Okla., by W. E. Page, E. J. Doerner and H. O. Bland, all of Tulsa. The company is capitalized at $10,000 and proposes to supply electricity for light and power in the town of Vera.

THE LAKE CITY (IOWA) UTILITY COMPANY has been incorporated with a capital stock of $40,000, to erect and operate an electric light and power plant. H. D. Yetter is president.

Record of Electrical Patents

Notes on United States Patents

(Issued Feb. 7, 1922)

1,405,812. ANNUNCIATOR DROP: Frank W. Wood, Montclair, N. J. App. filed Oct. 24, 1919. Shifted both into and from operative position at will.

1,405,819. MINE AND LIKE ELECTRIC BELL; Josef B. Eder, Johannesburg, Transvaal, South Africa. App. filed Feb. 18, 1918. Moisture-proof for mine use.

1,405,849. VIBRATION DETECTOR: Herman T. Kohlhaas, Brooklyn, N. Y. App. filed July 28, 1919. Detects vibrations propagated through water.

1,405,905. RADIO RECEIVING APPARATUS; Francis W. Dunmore, Washington, D. C. App. filed Feb. 4, 1921. Vacuum-tube system.

1,405,935. MOUNTING PLATE FOR ELECTRICAL PROTECTIVE APPARATUS: Frederick R. Parker, Chicago, Ill. App. filed June 1, 1921. Three metal plates assembled broadsidedly.

1,405,942. STARTING SYSTEM; Elmer H. Schwarz, Glen Rock, N. J. App. filed July 5, 1918. Starter and manifold heater operate together.

1,405,956. ELECTRIC REGULATOR; William A. Turbayne, Niagara Falls, N. Y. App. filed Aug. 26, 1918. Utilizes a compressible pile.

1,405,965. MOTOR GENERATOR: Charles H. Bunch, Cleveland, Ohio. App. filed March 31, 1920. For storage-battery charging with removable stator winding.

1,405,979. IGNITION APPARATUS: Farnum F. Dorsey, Rochester, N. Y. App. filed July 26, 1917. Means for mounting and incasing induction coil.

1,406,002. PROTECTIVE MEANS FOR ELECTRICAL APPARATUS HAVING WINDINGS; Joseph Goodman, Hayes, England. App. filed Nov. 20, 1917. By spark gap grounded through condenser and choke coil.

1,406,039. ELECTRIC SYSTEM FOR MOTOR VEHICLES; Thomas L. Lee, Rochester, N. Y. App. filed Nov. 4, 1919. Protective resistance for short circuit.

1,406,048. INTAKE HEATER FOR GASOLINE ENGINES; Eldridge V. McCulloch, Hutchinson, Kan. App. filed Dec. 4, 1919. Electric element.

1,406,057. ELECTRICALLY HEATED RADIATOR; James H. Mills, Gallipolis, Ohio. App. filed April 5, 1920. Automatic cut-out for room use.

1,406,100. ELECTRIC WATER HEATER; Richard M. Stephens, Irving, Tex. App. filed June 23, 1920. Two hollow carbon cylinders with water to complete circuit.

1,406,149. ELECTRICAL DEVICE; Theodore W. Case, Scipio, N. Y. App. filed Jan. 22, 1918. Amplifier and detector of changes in voltage in a primary circuit.

(Issued Feb. 14, 1922)

1,406,164. AUTOMATIC ELECTRIC INCUBATOR; William J. Anderson, Caulfield, Victoria, Australia. App. filed April 5, 1920. Temperature control.

1,406,172. ENGINE STARTING SYSTEM; William A. Chryst, Dayton, Ohio. App. filed Oct. 23, 1918. Automobile motor-generator set.

1,406,181. ELECTRIC WATER HEATER; Robert J. Frost, Clayton, Victoria, Australia. App. filed Aug. 27, 1920. Water tubes short-circuit transformer core.

1,406,184. ARMATURE FOR DYNAMO-ELECTRIC MACHINES; Nelson R. Haas, Dayton, Ohio. App. filed July 14, 1919. Automobile motor-generator set.

1,406,195. TESTING APPARATUS FOR TELEPHONE SWITCHBOARD CORDS; George W. Kuhn, Brooklyn, N. Y. App. filed Dec. 11, 1920. Portable apparatus to locate trouble.

1,406,221. TELEPHONE EXCHANGE SYSTEM; Lipa Polinkowsky, New York, N. Y. App. filed June 5, 1919. Machine switching.

1,406,234. CIRCUIT INTERRUPTER; Joseph Slepian, Pittsburgh, Pa. App. filed Nov. 4, 1918. For increasing capacity of electrolytic cells.

1,406,235. ELECTRICAL MEASURING INSTRUMENT; Benjamin H. Smith, Turtle Creek, Pa. App. filed Aug. 30, 1916. Measures volt-amperes of alternating-current circuit.

1,406,236. TELEPHONE SYSTEM; Arthur B. Sperry, New York, N. Y. App. filed Nov. 8, 1919. For indicating unstandard conditions.

1,406,239. ELECTRODE AND ELECTROLYTIC BATTERY; Alexander T. Stuart, Toronto, Ontario, Canada. App. filed July 1, 1919. Oxygen-hydrogen generator.

1,406,245. LAMINATED MAGNETIC CIRCUIT STRUCTURE FOR TRANSFORMERS; Chester H. Thordarson, Chicago, Ill. App. filed Feb. 3, 1916.

1,406,246. TESTING AND ADJUSTING APPARATUS FOR CORD CIRCUITS; John F. Toomey, New York, N. Y. App. filed Jan. 30, 1920. For proper functioning of telephone relays.

1,406,255. MOTOR-CONTROL SYSTEM; Edgar M. Bouton, Wilkinsburg, Pa. App. filed Oct. 3, 1917. For blower motors to maintain constant pressure.

1,406,257. RHEOSTAT: Arthur W. Brice, Rochester, N. Y. App. filed May 16, 1916. Wide range of adjustment.

1,406,285. TROLLEY FROG; Edward E. Rose, Swissvale, Pa. App. filed May 6, 1919. Relates to approach members for frogs, crossings, etc.

1,406,286. TROLLEY-FROG APPROACH; Edward E. Rose, Edgewood Park, Pa. App. filed March 31, 1920. Automatically bends wire when attaching approach member to frog.

1,406,288. WIRE-SUPPORTING STRUCTURE; William Schaake, Pittsburgh, Pa. App. filed Sept. 17, 1920. Strain plate between the guy wires and the trolley wire.

1,406,312. INDICATOR FOR GASOLINE, ETC. Sheldon M. Wessoleck, New Britain, Conn. App. filed July 21, 1920. Float linked with variable resistance and ammeter.

1,406,328. TEMPERATURE-REGULATING MEANS FOR FILAMENTARY ELECTRODES; Alfred L. Atherton, Edgewood Park, Pa. App. filed Jan. 29, 1917. To maintain the filament temperature constant.

1,406,352. THERMOSTAT; Paul E. Demmler, Pittsburgh, Pa. App. filed Nov. 13, 1919. For actuating protective devices.

1,406,359. MINER'S ELECTRIC SAFETY LAMP; Arthur P. Ford, Stoke-Upon-Trent, England. App. filed March 10, 1921. Lamp having two bulbs in parallel.

1,406,360. FLEXIBLE WATER HEATER; Frank F. Forshee, Flint, Mich. App. filed June 17, 1920. With refractory resistor-supporting means.

1,406,366. ALTERNATING-CURRENT MOTOR; Valere A. Fynn, St. Louis, Mo. App. filed Dec. 26, 1916. Single-phase synchronous induction motor.

1,406,367. ALTERNATING-CURRENT MOTOR; Valere A. Fynn, St. Louis, Mo. App. filed Dec. 26, 1916. Single-phase synchronous induction motor.

1,406,372. ELECTRIC OVEN; Albert E. Grapp, Minneapolis, Minn. App. filed May 21, 1921. Especially adapted for baking of bread.

1,406,376. MOTOR-CONTROL SYSTEM; Albert L. Harvey, Wilkinsburg, Pa. App. filed Sept. 10, 1917. Automatic starting device for motors.

1,406,377. MOTOR-CONTROL SYSTEM; Albert L. Harvey, Braddock Township, Pa. App. filed Nov. 7, 1917. For operating a fluid system at uniform pressure.

1,406,383. MOTOR-CONTROL SYSTEM; Charles H. Hodgkins, Pittsburgh, Pa. App. filed Sept. 10, 1917. Automatic starting device for motors.

1,406,389. CONTROLLER; Henry D. James, Edgewood Park, Pa. App. filed Sept. 21, 1916. Motor-starting controller operated by pilot motor

1,406,393. RESISTOR; Howard H. Johnston, Edgewood Park, Pa. App. filed May 14, 1920. Concentrically mounts plurality of tubular resistors of different diameters.

1,406,405. AUTOMATIC CONTROL MECHANISM; William H. McGee and Reni S. Berry, Los Angeles, Cal. App. filed Feb. 21, 1918. Operation of airplane by remote control.

1,406,428. TELEGRAPH SOUNDER; Chester H. Teegarden, Washington, D. C. App. filed Sept. 25, 1918. Pertains to watchcase type.

1,406,429. DRY CELL; George W. Vinal and Homer D. Holler, Washington, D. C. App. filed Jan. 22, 1919. Kept in a dry condition as long as desired.

1,406,442. RADIO RECEIVING SYSTEM; Louis Cohen, Washington, D. C. App. filed Dec. 28, 1918. Double coupling, electrostatic and electromagnetic.

1,406,445. PHOTOGRAPHIC RECEIVING APPARATUS; Charles A. Culver, Beloit, Wis. App. filed June 19, 1919. For recording oscillating signals.

1,406,448. COMMUTATOR. Albert E. Doman, Syracuse, N. Y. App. filed Dec. 18, 1918. Commutator bars split for holding windings.

1,406,452. FLASHLAMP; Louis M. Evans and George W. Steinmann, Washington, D. C. App. filed June 16, 1920. Shutter to limit amount of light.

1,406,488. RADIOTHERAPEUTICAL SHIELD; Marguerite A. Pugh, New Orleans, La. App. filed Dec. 10, 1917. To localize the action of radioactive materials.

1,406,495. AUTOMATIC COMMUTATOR BRUSH ADJUSTER; Clarence Rumfelt, Oakland, Cal. App. filed March 3, 1919. Operated by solenoid connected in load.

1,406,500. ELECTRIC APPARATUS FOR INDICATING AND REPEATING MOVEMENTS AT A DISTANCE; Eugene Schneider, Paris, France. App filed June 16, 1919. Based on principle of Wheatstone bridge.

1,406,507. RECORDER; James N. Tuttle, Newton Center, Mass. App. filed Sept. 9, 1919. Heated stylus marks on record sheet sensitive to heat.

1,406,510. AURICULAR TELEPHONE; Louis Weber, Charlottenburg, Germany. App. filed Oct. 26, 1920. Receiver can be inserted in auditory duct of ear.

1,406,542. ELECTRODE; Irving S. Crocker, Lynn, Mass. App. filed March 17, 1921. Process for making dense arc-light electrodes.

1,406,550. ELECTRICAL HEATING APPARATUS; Henry Geisenhoner, Schenectady, N. Y. App. filed June 21, 1920. For soldering irons, etc.

1,406,551. ELECTRIC HEATING APPARATUS; Henry Geisenhoner, Schenectady, N. Y. App. filed June 21, 1920. Article heated by passage of current through it.

1,406,565. ELECTRICAL SYSTEM; Edwin S. Lammers, Jr., Wilkinsburg, Pa. App. filed Nov. 16, 1917. Control for rolling-mill motors.

1,406,566. SECONDARY WINDING FOR ASYNCHRONOUS MOTORS; Arvid Lindström, Vesterås, Sweden. App. filed March 18, 1921. Automatic control of position of conductors in slots of rotor.

Construction News

Projects, Plans, Bids and Contracts Contemplated or Under Way

New England States

UNITY, N. H.—The Newport (N. H.) Electric Light Company has applied to the Public Service Commission for permission to furnish electricity in Unity.

BOSTON, MASS.—Motors and other electric equipment will be installed in the car inspection shop, 60 ft. x 500 ft., to be constructed by the Boston Elevated Railway Company, at the Forest Hills Terminal, for which bids will be taken until March 10. A. J. Blackburn is engineer.

BOSTON, MASS.—An electric power department will be installed in the junior high school to be erected on Dixwell Avenue, at a cost of about $660,000. James J. Driscoll, 6 Beacon Street, architect.

FALL RIVER, MASS.—A power house and pumping plant will be constructed by the Atlantic Refining Company, 3144 Passyunk Avenue, Philadelphia, at its proposed oil refining and distributing plant, foot of Slade Street, to cost about $1,000,000.

NORTH WEYMOUTH, MASS.—The Edison Electric Illuminating Company, has purchased a site in North Weymouth on which it will build a large power house.

Middle Atlantic States

BINGHAMTON, N. Y.—An ordinance providing for the installation of an ornamental lighting system on Chenango Street from Court Street to Lewis Street has been adopted by the Council. The installation of an ornamental lighting system on Water Street from Court Street to Ferry Street is under consideration.

CORNING, N. Y.—An electric power department will be installed in the new high school to be erected at a cost of $465,000. F. H. Dewey & Company, 175 Fifth Avenue, New York, are architects.

NEW YORK, N. Y.—Motors and other electrical and mechanical equipment will be installed in the plant addition to be erected by the A. C. Chesley Company, 704 East 133d Street.

HAILESBORO, N. Y.—The St. Lawrence Transmission Company, Potsdam, has purchased the hydro-electric plant of the Uniform Fibrous Talc Company on the Oswegatchie River in Hailesboro. The St. Lawrence company, it is understood, plans to install an additional 1,000-hp. generating unit.

NEWARK, N. J.—By a decision handled down by the State Supreme Court the referendum vote on the question of establishing a municipal electric light, heat and power plant was held invalid. The proposition will be presented again to voters.

NIAGARA FALLS, N. Y.—The Council is arranging an amendment to the city charter to provide for the establishment of a municipal power plant.

NEWPORT, N. Y.—The Newport Electric Light & Power Company is planning the installation of an additional electric generating unit, to cost about $14,000. Application has been made to the Public Service Commission for permission to issue $25,000 in bonds.

PATCHOGUE, N. Y.—The Patchogue Electric Light Company has filed notice of increase in capital from $200,000 to $300,000.

TROY, N. Y.—A power house will be installed at the cold-storage and ice-manufacturing plant to be established by the Fitzgerald Brothers Brewing Company, at a cost of $200,000. Ophuls, Hill & McCreery, 112 West Forty-second Street, New York, are architects and engineers.

TROY, N. Y.—The Eastern Malleable Iron Works will take new bids at once for the erection of a one-story power plant, 50 ft. x 175 ft.

EAST ORANGE, N. J.—The Water Commission is planning for the installation of electrially operated pumping machinery at the White Oak Ridge waterworks extension. The entire cost is estimated at $200,000.

EAST PATERSON, N. J.—The power house and other buildings at the plant of the Coirin Chemical Works, River Road, were recently destroyed by fire, causing a loss of about $150,000. Frederick Coirin is head.

ALTOONA, PA.—The Penn Central Light & Power Company has purchased the properties of the Standard Public Service Company of Claysburg and the Freedom Electric Company, charters of which cover the towns of East Freedom, McKee, Claysburg and Sproul.

NEWARK, N. J.—The Gulf Refining Company, Doremus Avenue, has filed plans for an addition to its power house.

NEWARK, N. J.—Plans have been filed by the Lock Joint Rifle Company, Cornelia Street and Albert Avenue, for the construction of a number of shop buildings, including a power house.

CARLISLE, PA.—The County Commissioners have plans under way for a new central power house, to be erected about a mile from the city. Frank G. Fahnestock, Jr., Patriot Building, Harrisburg, is architect.

OIL CITY, PA.—Arrangements have been made by the Citizens' Light & Power Company for issuing $43,000 in bonds, the proceeds to be used for extensions and improvements to its system.

PHILADELPHIA, PA.—Martin H. Walrath & Son are having estimates prepared for a factory, power house and garage on Indiana Avenue.

PHILADELPHIA, PA.—The Oscar Nebel Knitting Company, 3860 Coral Street, has filed plans for the construction of a power house at Fifth and Annsbury Streets, to cost about $75,000.

PHILADELPHIA, PA. — An electric power department will be installed in the three-story plant, 72 ft. x 190 ft., to be erected on Rising Sun Avenue by the Andross Worsted Company, Bridge and Charles Streets, to cost about $350,000. The Ballinger Company, Twelfth and Chestnut Streets, is architect.

PHILADELPHIA, PA.—A power house will be installed in the new factory to be erected by the Gotham Silk Hosiery Company, 515 Fifth Avenue, New York, at Second and Norris Streets, to cost about $200,000. William Steele & Sons, 1600 Arch Street, are architects and builders.

RIDGEWAY, PA.—The Keystone Power Corporation, recently organized with a capital of $1,250,000, will take over and operate a number of power and transmission line companies operating in Elk and adjoining counties. H. S. Clader, 5461 Lebanon Avenue, Philadelphia, is treasurer.

VENANGO, PA.—H. F. King, representing the Venango Electric Company, has applied to the Pennsylvania Public Service Commission for permission to furnish electricity for light, heat and power in the borough of Venango and vicinity.

WILMINGTON, DEL. — The United States Engineers Office will take bids until March 20 for a complete pumping unit for use at Chesapeake City, Md. Alternate estimates will be received for electrical, steam and oil-driven equipment.

WILMINGTON, DEL. — The Board of Street & Sewer Commissioners contemplates installation of an ornamental street-lighting system on King, Ninth, Tenth and Washington Streets.

BALTIMORE, MD.—The Board of Street Commissioners is planning to erect a central automatic fire-alarm station.

KENNEDYVILLE, MD.—The Kennedyville Electric Company has been formed by local interests to construct and operate a power plant in Kennedyville.

SABILLASVILLE, MD. — The Maryland Sanatorium will discontinue its present power plant and will secure electricity from the lines of the Hagerstown & Frederick Railway, for which a contract has been signed.

BUCKHANNON, W. VA. — A power house will be installed at the new planing mill and woodworking plant to be erected by C. E. Hines.

CHARLESTON, W. VA.—The Council is considering an issue of $300,000 in bonds for extensions to the electric lighting and waterworks systems.

North Central States

BIG RAPIDS, MICH.—The Big Rapids Electric Company will build an addition to its power plant, including the installation of an electric generator and oil engine. W. A. Stillwell is secretary.

DETROIT, MICH.—The Ford Motor Company will extend its transmission system from the River Rouge power plant to the works of the Lincoln Motor Company.

DETROIT, MICH.—The Père Marquette Railroad Company is planning the installa-

tion of a wireless train-control system, covering about 50 miles of line, to cost about $200,000.

DETROIT, MICH. — The Detroit Edison Company contemplates extensions and improvements to its system during the present year, including the completion of the generating plant on the St. Clair River, Marysville, Mich., and development of the power site for a steam-operated plant on the Trenton Channel of the Detroit River. The cost is estimated at $3,000,000.

MOUNT PLEASANT, MICH.—A power plant will be built by the National Portland Cement Company at its new mill at Coldwater Lake, to cost about $500,000. H. C. Shields is manager.

SAULT STE. MARIE, MICH.—The Cadillac Lumber & Chemical Company will build a power plant at its new works at Sault Ste. Marie, for which plans are being prepared.

CLEVELAND, OHIO. — A petition has been submitted to the City Council by residents of Clark Avenue requesting the installation of an ornamental lighting system on that thoroughfare. The Council has authorized the installation of electric lamps on Lenacrave Avenue between East 116th Street and East 131st Street.

MIDDLETOWN, OHIO. — An electric power department will be installed in the proposed new high school, to cost $650,000. T. D. McLaughlin, Savings Bank Building, Lima, Ohio, is architect.

ELIZABETHTOWN, IND. — The Elizabethtown Light & Power Company, recently organized, has contracted with the Interstate Public Service Company for electricity. A transmission line will be erected from Elizabethtown to Mineral Springs, Ind., where connection with the Interstate lines will be made. A substation and distribution system covering a 5-mile radius will be erected at Elizabethtown.

FORT WAYNE, IND.—The Keenan Hotel Company, care of the Anthony Hotel, 128 West Berry Street, plans to install a power plant in the new fifteen-story hotel to be erected at a cost of about $900,000. C. R. Weatherhogg, Citizens' Trust Building, is architect.

CHICAGO, ILL.—The Department of Gas and Electricity has recommended issuing $15,000,000 for extensions to the street-lighting system in Chicago.

DECATUR, ILL.—Plans are under consideration by the Illinois Traction Company, Champaign, for the construction of a new power plant in Decatur, to cost, including equipment, about $100,000.

ELKHORN, WIS.—Plans are under consideration by the Wisconsin Butter & Cheese Company for the installation of an electric generating unit. Cahill & Douglas, 217 West Water Street, Milwaukee, are engineers.

SHOALS, IND. — The Shoals Light & Power Company will extend its system to new coal-mining properties now being opened.

MILWAUKEE, WIS. — The Interior Woodwork Company, 521-529 Park Street, contemplates the installation of electrical equipment in its power plant and for factory operation. Cahill & Douglas, 217 West Water Street, are consulting engineers.

RHINELANDER, WIS.—The Rhinelander Paper Company is considering the installation of additional equipment in its power plant and boiler house. Cahill & Douglas, 217 West Water Street, Milwaukee, are consulting engineers.

FORT MADISON, IOWA. — An electric power department will be installed in the three-story-and-basement high school to be erected in Fort Madison at a cost of $350,000. Owen, Payson & Carswell, Interstate Building, Kansas City, Mo., are architects.

MUSCATINE, IOWA. — Bonds to the amount of $350,000 have been voted for the establishment of a municipal electric light and power plant in Muscatine.

OSKALOOSA, IOWA. — The Council is having tentative plans drawn for the erection of a hydro-electric generating plant on the Des Moines River, near Harvey, Iowa, to cost $350,000. The Fargo Engineering Company, Jackson, Mich., is engineer.

FULTON, MO.—The Council contemplates the installation of additional equipment at the municipal electric plant.

LAMAR, MO.—The Osage Power Development Company contemplates the construction of a hydro-electric plant on Linn Creek, to cost about $5,000,000, including a steel-tower transmission system about 100 miles long. W. R. Banks is general manager.

FARGO, N. D.—The Union Light, Heat & Power Company contemplates the construction of a new electric plant in Fargo.

HILLSBORO, N. D.—The Council contemplates improvements to the municipal electric plant. The C. L. Pillsbury Company, 1200 Second Avenue, South Minneapolis, Minn., is engineer.

EDGEMONT, S. D.—The electric light plant of the Western Utilities Company in Edgemont is reported to have been destroyed by fire.

SIOUX FALLS, S. D.—The Tri-County Transmission Company has been organized to take over the power plants in Bridgewater, Marion and Emery, and will erect a 33,000-volt line from a point 10 miles west of Sioux Falls on the Wall Lake Road to Bridgewater, to transmit electricity to the three towns. The company has entered into a contract with the Northern States Power Company whereby it will secure electricity from the latter company for a period of ten years, taking effect about May 1. G. W. Laing, Bridgewater, is president of the Tri-County company.

Southern States

CHARLOTTE, N. C.—An electric power department will be installed in the new high school to be erected in Charlotte, to cost about $300,000. Lockwood, Greene & Company, Piedmont Building, are architects.

ENFIELD, N. C.—Bids to be received at the office of Allen W. Andelton, Mayor, for the construction of an electric light plant, waterworks and sewerage system have been postponed from March 1 to March 15. W. C. Olsen, Kinston, is consulting engineer.

NEW BERN, N. C. — The Council has authorized plans for a new street-lighting system in the business district, to cost about $25,000.

VANCEBORO, N. C.—The Town officials are considering issuing $15,000 in bonds for the erection of a transmission line from the municipal power plant in Newbern to Vanceboro, via Bridgeton, a distance of 18 miles.

CLEARWATER, FLA. — The Council is planning the installation of a municipal electric plant.

ST. PETERSBURG, FLA.—A movement has been started to establish an electric power plant to furnish electricity for street-lighting and for the operation of the city-owned car lines.

SMYRNA, TENN.—The Smyrna Electric Light Company, recently organized, contemplates the erection of an electric transmission line from Walter Hill to Smyrna. Electricity will be furnished by the Murfreesboro Electric Light & Power Company. J. H. Edwards is president of the new company.

YELLVILLE, ARK. — Negotiations are under way whereby the Dixie Power Company will erect an electric transmission line from the proposed Dixie Dam on the White River near Cotter to Yellville. The project also includes the construction of an electric railway connecting the Buffalo River mining and timber region with the railroad here.

COVINGTON, LA. — The St. Tammany Ice, Light & Water Company is considering improvements to its plant. Henry A. Mentz, Magnolia, Miss., is consulting engineer.

BYNG, OKLA.—The Oklahoma Power & Transmission Company, Ada, is contemplating, it is reported, the installation of an additional generating unit during the present year.

FOSS, OKLA.—Improvements to the municipal electric plant and water system are under consideration. H. G. Olmstead & Company, Oklahoma City, are engineers.

HUGO, OKLA.—The Hugo Ice & Light Company has obtained a franchise to erect a high-tension transmission line from Hugo to Fort Towson, via Sawyer.

VALLIANT, OKLA.—The Valliant Light & Power Company has been granted a franchise to establish an electric plant and distribution system in Valliant.

VERA, OKLA.—At an election to be held March 20 the proposal to issue $7,000 in bonds for the construction of an electric light and power system will be submitted to the voters.

DENISON, TEX.—The Texas Power & Light Company has plans under way for the construction of a new generating plant in Denison. The station will furnish service between Denison and Wichita Falls, Tex.

HUTTO, TEX.—Hanstrom & Tinning are planning to rebuild their electric plant, recently destroyed by fire.

KAUFMAN, TEX.—The City Council contemplates improvements to the lighting system.

TEMPLE, TEX.—Steps have been taken to secure the installation of an ornamental lighting system in the business district of Temple.

WILLS POINT, TEX.—The Council is considering the establishment of a municipal electric plant in Wills Point.

Pacific and Mountain States

EVERETT, WASH. — The Puget Sound International Railway & Power Company is planning extensions in its transmission system to cost about $80,000, and also to its distribution lines.

SPOKANE, WASH. — The Washington Water Power Company contemplates extending its high-tension transmission line into Grant County, west of Spokane, a distance of 110 miles. Substations will be erected in Stratford and Neppel. The cost is estimated at $250,000. M. W. Birkett is acting general manager.

GLENDALE, CAL. — Steps have been taken by the San Fernando Boulevard Improvement Association for the installation of ornamental lamps along San Fernando Road between Los Felez Road and Pacific Avenue. R. Johnson, 1133 South San Fernando Road, is interested.

HOLLYWOOD, CAL.—Steps have been taken by the Greater Hollywood Improvement Association for the erection of ornamental lamp posts on a portion of Santa Monica Boulevard.

MADERA, CAL.—The City Trustees are negotiating with the Pacific States Gas Company for the installation of an ornamental electric street-lighting system in the business section. Frank Nikerk is city engineer.

SALINAS, CAL.—The Shell Oil Company has obtained a permit to construct a substation south of Alisal Street, to cost about $15,000.

VENTURA, CAL.—The installation of an ornamental lighting system on Main Street from Chestnut to Crimea is under consideration.

LOGAN, UTAH.—The city officials are considering the installation of electric meters in the city.

PAROWAN, UTAH.—The city clerk has applied to the State Engineer for permission to divert 21.03 cu.-ft. of water from Center Creek in Iron County, to develop 340 hp. to furnish electricity for light and power in Parowan.

SEVIER, UTAH.—The Telluride Power Company, Salt Lake City, has filed application with the State Engineer for the diversion of 100 sec.-ft. of water from the Sevier River below the town of Sevier. The plans call for a development of 900 hp.

DENVER, COL.—Arrangements have been made by the Denver Gas & Electric Company for issuing $3,000,000 in bonds, part of the proceeds to be used for extensions and improvements to its system.

Canada

WINNIPEG, MAN.—The provincial government is having estimates prepared for the extension of an electric transmission line to Brandon.

HALIFAX, N. S. — Plans are reported under way for the establishment of a new lighting system in Halifax.

WASHAGO, ONT. — The Hydro-Electric Power Commission of Ontario, Toronto, is considering the erection of a transmission line from Wasdall's Falls to Washago.

MONTREAL, QUE.—The Ottawa & Hull Power Company, Hull, is having plans prepared for the construction of a dam in connection with a hydro-electric development at Calumet Falls. The plans call for four units of 14,500 hp. each, operating under a 63-ft. head, and one smaller service unit. William Kennedy, 364 University Avenue, Montreal, is consulting engineer.

MONTREAL, QUE.—A joint application has been made to the Quebec Legislature by the Canadian Light & Power Company, Montreal, and the Public Service Corporation for permission to develop a hydro-electric project at Carrillon, on the Ottawa River, to cost approximately $20,000,000, including the erection of transmission lines, transformer stations, etc. The total cost of the project is estimated at about $40,000,000.

Miscellaneous

FRONTERA, MEXICO.—Steps have been taken by an English corporation for the development of an electric power project for the State of Tabasco. The plans include the construction of a 31,000-hp. hydro-electric plant at a waterfall on the San Pedro River and the erection of transmission lines to the principal cities and towns. The company also plans to build a large plant for the manufacture of wood pulp.

Directory of Electrical Associations

Printed in the First Issue of Each Month

ALABAMA LIGHT AND TRACTION ASSOCIATION. Secretary-treasurer, J. P. Ross, Birmingham Railway, Light & Power Co., Birmingham, Ala.

AMERICAN ASSOCIATION OF ENGINEERS. Secretary, C. E. Drayer, 63 East Adams St., Chicago, Ill.

AMERICAN ASSOCIATION OF OPERATING ENGINEERS. Secretary, H. C. Bristol, Calderwood, Tenn.

AMERICAN ELECTRIC RAILWAY ASSOCIATION. Executive secretary, J. W. Welsh, 8 West 40th St., New York City.

AMERICAN ELECTROCHEMICAL SOCIETY. Acting secretary, A. D. Spillman, Lehigh University, Bethlehem, Pa. Annual convention Baltimore, April 27-29.

AMERICAN ENGINEERING STANDARDS COMMITTEE. Secretary, P. G. Agnew, 29 West 39th St., New York City.

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ARKANSAS UTILITIES ASSOCIATION. Secretary, R. I. Brown, Little Rock Railway & Electric Company, Little Rock, Ark.

ASSOCIATED MANUFACTURERS OF ELECTRICAL SUPPLIES. General secretary, C. E. Dustin, 30 East 42d St., New York City.

ASSOCIATION OF EDISON ILLUMINATING COMPANIES. Secretary, Preston S. Millar, 80th St. and East End Ave., New York.

ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS. Secretary, John F. Kelly, Empire Building, Pittsburgh, Pa.

ASSOCIATION OF MUNICIPAL ELECTRICAL UTILITIES OF ONTARIO. Secretary, S. R. A. Clement, 190 University Ave., Toronto.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS. Secretary-treasurer, Joseph A. Andreucetti, Chicago & Northwestern Railway, Room 413, C. & N. W. Terminal Station, Chicago, Ill.

BRITISH COLUMBIA ELECTRICAL CO-OPERATIVE ASSOCIATION. Field Manager, R. E. Chatfield, 108 B. C. Electric Bldg., Vancouver, B. C.

CANADIAN ELECTRICAL ASSOCIATION, affiliated with N. E. L. A. Secretary-treasurer, Eugene Vinet, Shawinigan Water & Power Co., Montreal, Canada.

COLORADO ELECTRIC LIGHT, POWER AND RAILWAY ASSOCIATION. Secretary-treasurer, Miss Minnie B. W. Baker, 900 15th St., Denver, Col.

ELECTRIC HOIST MANUFACTURERS' ASSOCIATION. Secretary-treasurer, E. Donald Tolles, 165 Broadway, New York City.

ELECTRIC POWER CLUB. Executive secretary, S. N. Clarkson, 506 Laclede Gas Building, St. Louis, Mo. Annual meeting, Hot Springs, Va., June 5-7.

ELECTRICAL MANUFACTURERS' CLUB. Secretary, F. L. Bishop, Hartford Faience Co., Hartford, Conn.

ELECTRICAL MANUFACTURERS' COUNCIL. Executive secretary, Frederic Nicholas, 522 Fifth Ave., New York City.

ELECTRICAL SAFETY CONFERENCE. Secretary, Dana Pierce, 25 City Hall Place, New York City.

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION. General secretary, Franklin Overbagh, 411 South Clinton St., Chicago, Ill.

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION, ATLANTIC DIVISION. Secretary, E. Donald Tolles, 165 Broadway, New York City.

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION, PACIFIC COAST DIVISION. Secretary, Albert H. Elliot, 502 Flatiron Building, San Francisco, Cal.

ELECTRICAL TRADE ASSOCIATION OF CANADA. Secretary, William R. Stavely, Royal Insurance Building, Montreal, Canada.

EMPIRE STATE GAS AND ELECTRIC ASSOCIATION. Secretary, Charles H. B. Chapin, Grand Central Terminal Building, New York City.

FLORIDA ENGINEERING SOCIETY. Secretary, J. R. Benton, Gainesville, Fla. Annual meeting, Daytona, May 15-16.

GREAT LAKES GEOGRAPHIC DIVISION, N. E. L. A. Secretary-treasurer, R. V. Prather, 305 Illinois Mine Workers Bldg., Springfield, Ill.

ILLINOIS STATE ELECTRIC ASSOCIATION. Secretary-treasurer, R. V. Prather, 305 Illinois Mine Workers Bldg., Springfield, Ill. Meeting, Chicago, March 15-16.

ILLUMINATING ENGINEERING SOCIETY. General secretary, Clarence L. Law, 29 West 39th St., New York City. Sections in New York, Philadelphia, Chicago and Boston. Chapters in San Francisco, Cleveland and Toronto.

INDIANA ELECTRIC LIGHT ASSOCIATION. Secretary, Thomas Donohue, Lafayette, Ind.

INSTITUTE OF RADIO ENGINEERS. Secretary, Alfred N. Goldsmith, College City of New York, New York.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS. Secretary, C. R. George, Houston, Tex.

INTERNATIONAL ELECTROTECHNICAL COMMISSION (international body representing various national electrical engineering societies contributing to its support). General secretary, C. le Maistre, 28 Victoria St., Westminster, London, S. W., England.

IOWA SECTION, N. E. L. A. Secretary, W. G. Linn, Des Moines Electric Co., Des Moines, Iowa.

KANSAS PUBLIC SERVICE ASSOCIATION. Secretary-treasurer, W. W. Austin, Cottonwood Falls, Kan.

MICHIGAN ELECTRIC LIGHT ASSOCIATION. Secretary, Herbert Silvester, Edison Bldg., Ann Arbor, Mich.

MISSISSIPPI ELECTRIC ASSOCIATION, affiliated with the N. E. L. A. Secretary, W. A. Sullivan, Gulfport & Mississippi Coast Traction Co., Gulfport, Miss.

MISSOURI ASSOCIATION OF PUBLIC UTILITIES. Secretary-treasurer, F. D. Beardslee, 315 North 12th St., St. Louis, Mo.

NATIONAL ASSOCIATION OF ELECTRICAL CONTRACTORS AND DEALERS. Secretary, Farquson Johnson, 15 West 37th St., New York City, N. Y. State associations in Alabama, Arkansas, Connecticut, Georgia, Kansas, Illinois, Indiana, Iowa, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Jersey, New York, Ohio, Oregon, Pennsylvania, Tennessee and Wisconsin. Also members in Canada and unorganized states.

NATIONAL COUNCIL LIGHTING FIXTURE MANUFACTURERS. Secretary, Chas. H. Hofrichter, 23, Gordon Square Bldg., West 65th St., and Detroit Ave., Cleveland, Ohio.

NATIONAL ASSOCIATION OF ELECTRICAL INSPECTORS. Executive secretary, T. H. Day, 59 Deerfield Ave., Hartford, Conn.

NATIONAL ASSOCIATION OF RAILWAY AND UTILITY COMMISSIONERS. Secretary, James B. Walker, New York Transit Commission, New York City.

NATIONAL ELECTRIC LIGHT ASSOCIATION. Executive manager, M. H. Aylesworth, 29 West 39th St., New York City. Convention, Atlantic City, May 15-20.

NATIONAL ELECTRICAL CREDIT ASSOCIATION. Secretary, Frederic P. Vose, 1350 Marquette Building, Chicago, Ill.

NATIONAL FIRE PROTECTION ASSOCIATION. Chairman of electrical committee, Dana Pierce, 25 City Hall Place, New York City. Secretary of electrical committee, Ralph Sweetland, 141 Milk St., Boston, Mass.

NEBRASKA SECTION, N. E. L. A. Secretary-treasurer, Horace M. Davis, Bankers' Life Bldg., Lincoln, Neb.

NEW ENGLAND ELECTRICAL CREDIT ASSOCIATION. Secretary, James A. Loring, 161 Devonshire St., Boston, Mass.

NEW ENGLAND GEOGRAPHIC DIVISION N. E. L. A. Secretary, Miss O. A. Bursiel 149 Tremont St., Boston, Mass.

NEW MEXICO ELECTRICAL ASSOCIATION. Secretary-treasurer, Charles E. Twogood, Albuquerque, N. M.

NEW YORK ELECTRICAL CREDIT ASSOCIATION. Secretary, W. J. Kreger, 47 West 34th St., New York City.

NEW YORK ELECTRICAL SOCIETY. Secretary, George H. Guy, 29 West 39th St. New York City.

NORTH CENTRAL ELECTRIC ASSOCIATION, GEOGRAPHIC DIVISION, N. E. L. A. Secretary, H. E. Young, Minneapolis General Electric Co., Minneapolis. Annual meeting St. Paul, Minn., June 13-15.

NORTHWESTERN GEOGRAPHIC DIVISION, N. E. L. A. Secretary-treasurer, J. F. Orr, Idaho Power Co., Boise, Idaho. Annual meeting, Boise, Idaho, June 7-10.

OHIO ELECTRIC LIGHT ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio.

OKLAHOMA UTILITIES ASSOCIATION. Manager, H. A. Lane, 1106 First National Bank Bldg., Oklahoma City. Convention, Oklahoma City, March 14-16.

ONTARIO ASSOCIATION OF ELECTRICAL CONTRACTORS AND DEALERS. Secretary, J. A. McKay, 24 Adelaide St. West, Toronto, Ont.

PACIFIC COAST GEOGRAPHIC DIVISION, N. E. L. A. Secretary, S. H. Taylor, 527 Rialto Bldg., San Francisco, Cal. Annual meeting, Los Angeles, May 31-June 3.

PENNSYLVANIA ELECTRIC ASSOCIATION. State Section N. E. L. A. Secretary, H. M. Stine, 212 Locust St., Harrisburg, Pa.

PUBLIC SERVICE ASSOCIATION OF VIRGINIA. Secretary, R. M. Booker, Newport News & Hampton Railway, Gas & Electric Co., Hampton, Va.

PUBLIC UTILITIES ASSOCIATION OF WEST VIRGINIA. Secretary, A. Bliss McCrum, Charleston, W. Va.

RADIO CLUB OF AMERICA. Secretary, Renville H. McMann, 150 Nassau St., New York City.

ROCKY MOUNTAIN GEOGRAPHIC DIVISION, N. E. L. A. Treasurer, A. C. Cornell, Denver, Col.

SOCIETY FOR ELECTRICAL DEVELOPMENT, INC. Assistant to the president, W. L. Goodwin; secretary, Theo. E. Burger, 522 5th Ave., New York City. Annual meeting second Tuesday in May; directors' meetings second Tuesday in May and November; executive committee meetings every sixty days.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. Secretary, Dean F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

SOUTHEASTERN GEOGRAPHIC DIVISION, N. E. L. A. Secretary-treasurer, Charles A. Collier, Georgia Railway & Power Co., Atlanta, Ga.

SOUTHWESTERN GEOGRAPHIC DIVISION, N. E. L. A. Secretary, H. A. Lane, Oklahoma Utilities Association, 1106 First National Bank Bldg., Oklahoma City, Okla. Annual meeting, San Antonio, Tex., May 3-6.

SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Secretary, E. N. Willis, 403-4 Slaughter Bldg., Dallas, Tex.

TRI-STATE WATER AND LIGHT ASSOCIATION. Secretary-treasurer, W. F. Steiglitz, Columbia, S. C. Convention, Spartanburg, S. C., April 1922.

VERMONT ELECTRICAL ASSOCIATION. Secretary-treasurer, C. E. Warsaw, Burlington, Vermont.

WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary, W. S. Boyd, 175 West Jackson Blvd., Chicago, Ill.

WESTERN SOCIETY OF ENGINEERS. ELECTRICAL SECTION. Secretary, E. S. Nethercut, 1735 Monadnock Block, Chicago, Ill.

WISCONSIN ELECTRICAL ASSOCIATION. Secretary, W. M. Chester, 1408 First National Bank Bldg., Milwaukee, Wis. Annual meeting, Milwaukee, March 22-24.

WYOMING UTILITIES ASSOCIATION. Secretary, C. Luscombe, Western Light & Power Co., Boulder, Col.